

Low-Effect Habitat Conservation Plan

for

Bay Checkerspot Butterfly and Serpentine Endemic Plant Species in Santa Clara County, California

**Donald Von Raesfeld Power Plant
(02-AFC-03)**

Santa Clara, California

Prepared for:



Silicon Valley Power
City of Santa Clara

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EXECUTIVE SUMMARY

The City of Santa Clara's electric department, doing business as Silicon Valley Power (SVP), owns and operates the Donald Von Raesfeld Power Plant (DVR), an electric-generating power plant in the City of Santa Clara, Santa Clara County, California. Nitrogen deposition from this power plant may adversely affect serpentine endemic wildlife and plant species including the federally threatened Bay checkerspot butterfly (*Euphydryas editha bayensis*) and the federally endangered coyote ceanothus (*Ceanothus ferrisiae*), the federally endangered Metcalf Canyon jewelflower (*Streptanthus albidus* ssp. *albidus*), the federally endangered Santa Clara Valley dudleya¹ (*Dudleya abramsii* ssp. *setchellii*), and the federally endangered Tiburon paintbrush (*Castilleja affinis* ssp. *neglecta*). This Habitat Conservation Plan (HCP) has been developed to quantify the potential for nitrogen deposition resulting from the DVR, develop appropriate mitigation measures, and procure an incidental take permit under Section 10(a) of the Endangered Species Act.

SVP requests coverage by the 10(a)(1)(B) permit for operation of the DVR for 30 years.

DVR construction will not result in direct effects to the Bay checkerspot butterfly or serpentine bunchgrass ecosystems, but will have indirect effects through operations and maintenance. Cumulative effects associated with atmospheric nitrogen deposition to the Bay checkerspot butterfly are conservatively estimated as the equivalent of 40 acres of serpentine bunchgrass habitat.

Biological goals and objectives for the proposed HCP are as follows:

To reduce potential cumulative effects to Bay checkerspot butterfly and federally-listed serpentine plants from the DVR to less-than-significant levels. The objectives of this goal are:

- To acquire and establish a 40-acre property as a permanent conservation area called the DVR Ecological Preserve for Bay checkerspot butterfly and federally listed serpentine plants.
- To establish and fund an endowment for management of the DVR Ecological Preserve in perpetuity.

To protect, manage, and maintain the existing habitat for Bay checkerspot butterfly and federally-listed serpentine plants at the DVR Ecological Preserve. The objectives of this goal are:

- To monitor the DVR Ecological Preserve for plant composition, including cover of butterfly host and nectar sources, non-native grass, invasive weeds, and serpentine endemic plants.
- To minimize the spread of invasive weeds and non-native annual grasses in locations where they can have negative effects on the host and nectar plants for butterflies and on the listed endemic plants.
- To manage the DVR Ecological Preserve through controlled grazing.

¹ Botanical nomenclature in this document generally reflects the second edition of the Jepson Manual. (See Appendix A) for a list of updated names.

- To maintain a grazing lease on the 40-acre DVR Ecological Preserve for the life of the DVR Power Plant (30 years). The grazing regime shall be flexible enough to account for climatic variability and programmatic for the rancher. Currently a grazing regime of about one cow/calf pair per ten acres about six months of the year is used to maintain Bay checkerspot butterfly and other covered species.

To protect populations of Bay checkerspot butterfly and federally listed serpentine plants at the DVR Ecological Preserve. The objective of this goal is:

- To monitor populations of Bay checkerspot butterflies and the federally listed serpentine plants.

The DVR Ecological Preserve is located on Coyote Ridge in the Santa Clara Valley, just north of the junction of Highway 101 and Coyote Creek Golf Drive. The DVR Ecological Preserve is part of a larger property that spans a portion of the Coyote Ridge from the Anderson Reservoir to Highway 101. The primary management strategy to meet the goals and objectives is to use cattle grazing to control non-native annual grass cover to maintain habitat for the Bay checkerspot butterfly host and nectar plants.

Monitoring will be conducted to assess grassland and host and nectar plant conditions as well as Bay checkerspot butterfly populations. Management activities will be modified as indicated by the monitoring results.

1.0 INTRODUCTION

1.1 Background

The City of Santa Clara's electric department, doing business as Silicon Valley Power (SVP), owns and operates the Donald Von Raesfeld Power Plant (DVR), an electric generating power plant in the City of Santa Clara, Santa Clara County, California. The U.S. Fish and Wildlife Service (Service) and the California Energy Commission (CEC) have stated that nitrogen emissions from cars, industrial sources and power plants have led to degraded conditions in serpentine grassland ecosystems, which may adversely affect serpentine endemic wildlife and plant species including the federally threatened Bay checkerspot butterfly (*Euphydryas editha bayensis*) and the federally endangered coyote ceanothus (*Ceanothus ferrisiae*), Metcalf Canyon jewelflower (*Streptanthus albidus* ssp. *albidus*), Santa Clara Valley dudleya (*Dudleya abramsii* ssp. *setchellii*) and the Tiburon paintbrush (*Castilleja affinis* ssp. *neglecta*). This Habitat Conservation Plan (HCP) has been developed to quantify the potential for nitrogen deposition resulting from the DVR, develop appropriate mitigation measures, and procure an incidental take permit under Section 10(a) of the Endangered Species Act (Act). In April 2004, the Service determined that the DVR qualifies for a low-effect determination. Low-effect determinations are given to projects that have minor or negligible effects on federally-listed, proposed or candidate species and the habitat, and minor or negligible effects on other environmental values or resources. Consequently low-effect HCPs are given categorical exclusion under NEPA (Service, 1996).

1.2 Need for an Incidental Take Permit

SVP is requesting an Incidental Take Permit for effects of nitrogen deposition on Bay checkerspot butterfly due to operation of the DVR. The deposition of nitrogen, from emissions of cars, industrial sources and power plants (such as the DVR), facilitates growth of non-native grasses that outcompete host plants and nectar plants for the Bay checkerspot butterfly larvae and adults respectively, as well as the four federally-endangered plants. As a result, over time, the reduction in suitable habitat for host plants and nectar plants for the Bay checkerspot butterfly (due to increased presence of non-native grasses) contributes to a reduction in the local population, or even local extirpation, of the species in the area. Likewise, the increase in non-native grass populations would reduce habitat suitability for the four federally-listed plants and could result in local extirpation of these species. Therefore, SVP plans to obtain an incidental take permit for Bay checkerspot butterfly and will mitigate for potential adverse effects by acquiring and managing an approved 40-acre DVR Ecological Preserve, comprised of serpentine grassland, located along Coyote Ridge. Under section 9(a)(2)(B) of the Act, endangered plants are protected from removal, reduction to possession, and malicious damage or destruction in areas that are under federal jurisdiction. Section 9(a)(2)(B) of the Act also provides protection to plants from removal, cutting, digging up, damage, or destruction where the action takes place in violation of any state law or regulation or in violation of a state criminal trespass law.

1.3 Regulatory Framework

1.3.1 Federal Endangered Species Act

The federal Endangered Species Act (Act) and its implementing regulations prohibit the "take" of any fish or wildlife species that is federally-listed as threatened or endangered without prior approval pursuant to either Section 7 or Section 10 of the Act. Take is defined in the Act as "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct." Federal regulation 50 CFR 17.3 further defines the term "harm" in the take definition to mean any act "which actually kills or injures wildlife. Such act may include significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding or sheltering."

Section 10(a) of the Act establishes a process for obtaining an "incidental take permit," which authorizes non-federal entities to incidentally take federally listed wildlife or fish subject to certain conditions. "Incidental take" is defined by the Act as take that is "incidental to, and not the purpose of, the carrying out of an otherwise lawful activity." Preparation of a Habitat Conservation Plan (HCP) is required for all Section 10(a)(1)(B) permit applications. The U.S. Fish and Wildlife Service and the National Marine Fisheries Service (NMFS) have joint authority under the Act for administering the incidental take program. NMFS has jurisdiction over marine species, as well as anadromous fish species, and Service has jurisdiction over all terrestrial and freshwater fish and wildlife species.

Section 7 of the Act requires all Federal agencies to ensure that any action they authorize, fund, or carry out is not likely to jeopardize the continued existence of any species listed under the Act or result in the destruction or adverse modification of its habitat. Because the issuance of an incidental take permit to a non-federal entity constitutes a federal action, the Service must conduct an internal section 7 consultation, following the submission of an HCP for formal processing and review by a non-federal entity (*e.g.*, SVP). Section 7 requires consideration of several factors not explicitly required by Section 10. Specifically, section 7 requires consideration of the indirect effects of a project, effects on federally-listed plants, and effects on critical habitat. The Act requires that Service identify critical habitat to the maximum extent that it is prudent and determinable when a species is listed as threatened or endangered. The Service internal consultation results in a Biological Opinion prepared by Service regarding whether implementation of the HCP will result in jeopardy to any listed species or adversely modify critical habitat.

1.3.2 Habitat Conservation Plan Requirements and Guidelines

The Section 10 process for obtaining an incidental take permit has three primary phases: (1) the HCP development phase, (2) the formal permit processing phase, and (3) the post-issuance phase.

During the HCP development phase, the project applicant prepares a plan that integrates the proposed project or activity with the protection of listed species. An HCP submitted in support of an incidental take permit application must include the following information:

- Effects likely to result from the proposed taking of the species for which permit coverage is requested
- Measures that will be implemented to monitor, mitigate for, and minimize effects; funding that will be made available to undertake such measures; and procedures to deal with

unforeseen circumstances

- Alternative actions considered that would not result in “take” of a listed species
- Additional measures the Service may require as necessary or appropriate for purposes of the HCP

In 1996, the Service and NMFS issued new guidelines to streamline and expedite the HCP permit process. As part of the expedited process, the Service has established a special category of HCP, called a low-effect HCP, for projects with minor or negligible effects on federally-listed, proposed, or candidate species and their habitats, and minor or negligible effects on other environmental resources. Implementation of low-effect HCPs and their associated incidental take permits, despite authorization of some small level of incidental take, individually and cumulatively have a minor or negligible effect on the species covered in the HCP. The determination of whether an HCP qualifies for the low-effect category is based on the anticipated effects of the DVR prior to implementation of the mitigation plan.

In February 2003, SVP met with the Service to discuss the possibility of the DVR being eligible for a low-effect HCP determination. Subsequently, SVP prepared and submitted to Service a *Screening Form for Low-Effect HCP Determinations* and a document titled *Environmental Assessment Summary for the Pico Power Project*. Service reviewed the submitted materials and, in April 2004, tentatively determined that the DVR qualifies for a “low-effect” determination. The Service will make a final determination when it reviews the complete application package.

The permit processing phase begins with the submission of a complete application package, including an HCP and a permit application and a fee (\$100) from the applicant. The Service must also publish a Notice of Availability of the HCP in the Federal Register, prepare a (internal) Section 7 Biological Opinion, prepare Findings which evaluate the Section 10(a)(1)(B) permit application in the context of permit issuance criteria, and prepare an Environmental Action Statement, which is a brief document that serves as the Service record of compliance with the National Environmental Policy Act (NEPA) for categorically-excluded actions. A section 10 incidental take permit is granted upon a determination by Service that all requirements for permit issuance have been met. Statutory criteria for issuance of the permit are as follows:

- Take will be incidental
- The applicant will mitigate and minimize to the maximum extent practicable
- The applicant will ensure adequate funding for the HCP and changed circumstances
- The applicant will provide procedures to deal with unforeseen circumstances
- The taking will not appreciably reduce the likelihood of survival and recovery of the species in the wild

- The applicant will provide additional measures that Service requires as being necessary or appropriate
- The Service has received assurances, as may be required, that the HCP will be implemented

During the post-issuance phase, the permittee and land management entities implement the HCP, and the Service monitors the permittee's compliance with the HCP. The public is notified of permit issuance through the Federal Register.

1.3.3 National Environmental Policy Act

The National Environmental Policy Act (NEPA) requires that federal agencies analyze the environmental effects of their actions (in this instance, the issuance of an incidental take permit) and include public participation in the planning and implementation of their actions. Compliance with NEPA is obtained through one of three methods: 1) preparation of an environmental impact statement (generally used for high-effect HCPs), 2) preparation of an Environmental Assessment (generally used for moderate-effect HCPs), or 3) a categorical exclusion (allowed for low-effect HCPs). The NEPA process helps federal agencies make informed decisions with respect to the environmental consequences of their actions and ensures that measures to protect, restore, and enhance the environment are included, as necessary, as a component of their actions. Low-effect HCPs, as defined in the Service Habitat Conservation Planning Handbook, are categorically excluded under NEPA, as defined by the Department of Interior Manual 516DM2, Appendix 1, and Manual 516DM6, Appendix 1.

1.4 Plan Duration

SVP seeks a 30-year permit from the Service to cover those activities associated with operation of the DVR, for the life of the project (30 years).

1.5 Species to be Covered by this HCP

The species covered by this HCP include the federally-threatened Bay checkerspot butterfly (*Euphydryas editha bayensis*), as well as four federally endangered plant species: the coyote ceanothus (*Ceanothus ferrisiae*), Metcalf Canyon jewelflower (*Streptanthus albidus* ssp. *albidus*), Santa Clara Valley dudleya (*Dudleya abramsii* ssp. *setchellii*), and the Tiburon paintbrush (*Castilleja affinis* ssp. *neglecta*). Since the take prohibitions for plants are more limited than for fish and wildlife, take of the four listed plants cannot be authorized under the incidental take permit; however, the plant species would be included on the permit in recognition of the conservation benefits provided to the species under the HCP. Assurances provided under the “No Surprises” rule at 50 CFR 17.3, 17.22(b)(5), and 17.32(b)(5) would extend to the all five Covered Species.

1.6 Organization of this HCP

This HCP is divided into five sections that are generally based on the Habitat Conservation Planning Handbook (Service, 1996) as well as information contained in a Low-impact HCP for the Valley Elderberry Longhorn Beetle (Jones and Stokes, 1999) and another HCP for the Valley Elderberry Longhorn Beetle (Shimboff, 2003), provided by the Service as templates. Section 1 is the

introduction. Section 2 describes the DVR. Section 3 describes the biological setting within the DVR area and discusses the legal status of the Bay checkerspot butterfly and four federally-listed serpentine plant species, as well as describing their distribution and life histories. Section 4 describes the potential effects of the DVR on serpentine endemic species and provides an assessment of the level of “take” on these species from the DVR. Section 5 provides the conservation strategy for the serpentine endemic species, including the biological goals and objectives and mitigation measures. Section 6 describes implementation of the HCP, including responsibilities, management plan, and monitoring. Section 7 provides a discussion of the funding for the endowment that will be used to manage the DVR Ecological Preserve in perpetuity. Section 8 describes the DVR alternatives analyzed. Section 9 discusses changed and unforeseen circumstances. Section 10 provides the references and literature consulted in preparation of the HCP.

2.0 PROJECT DESCRIPTION

2.1 Project Description

2.1.1 Project Location

The DVR Power Plant is located in the City of Santa Clara, Santa Clara County, California (*see Figure 1*). The 2.86-acre DVR site is located west of the intersection of Lafayette Street and Duane Avenue and immediately north of SVP's Kifer Receiving Station. The DVR is surrounded by heavy industrial and light industrial land uses. The DVR site is owned by the City of Santa Clara and is zoned Public/Quasi-Public. The mitigation site, called the DVR Ecological Preserve, is located on Coyote Ridge in the Santa Clara Valley, just north of the junction of Highway 101 and Coyote Creek Golf Drive (*see Figure 2*).

Figure 1. DVR Power Plant Location

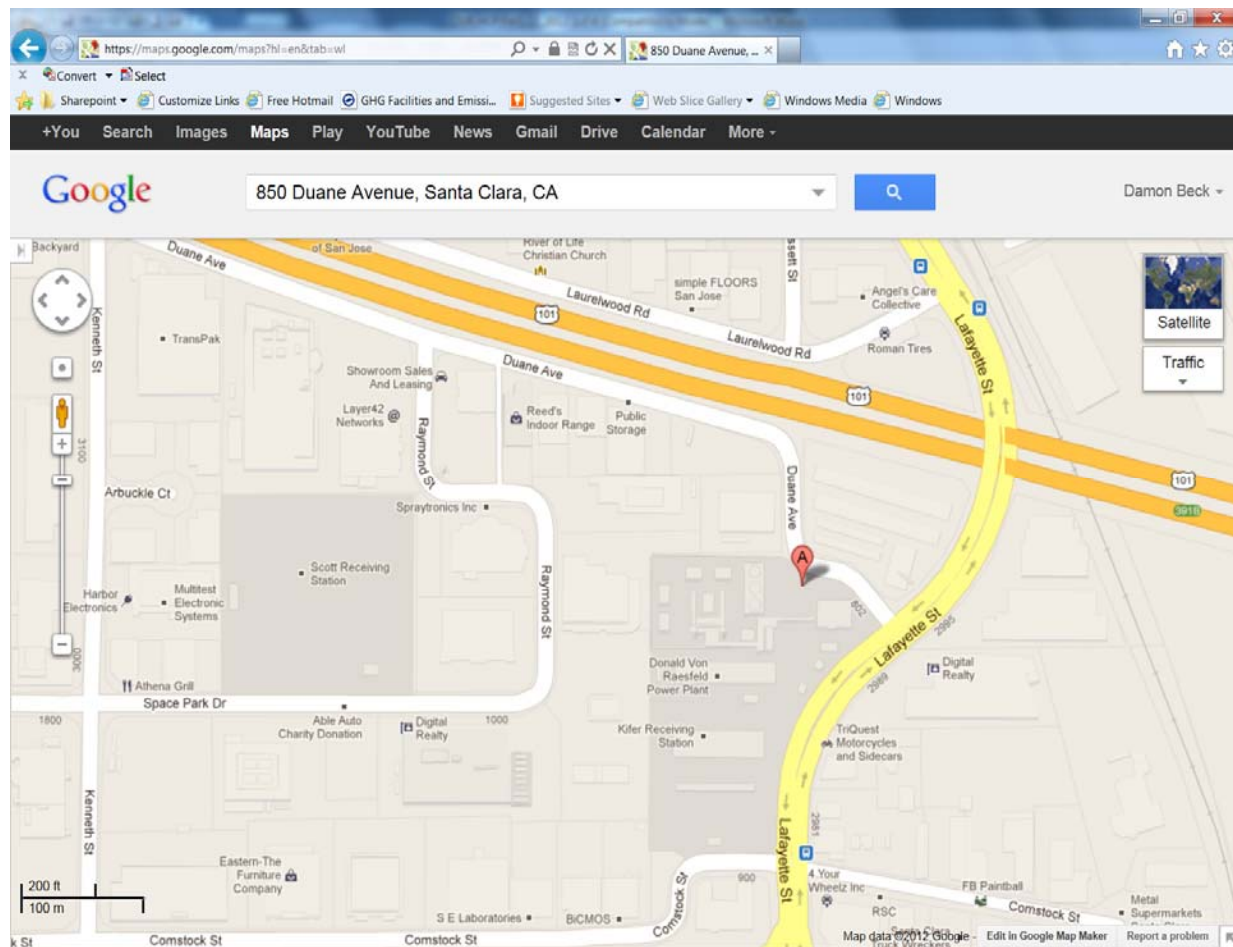
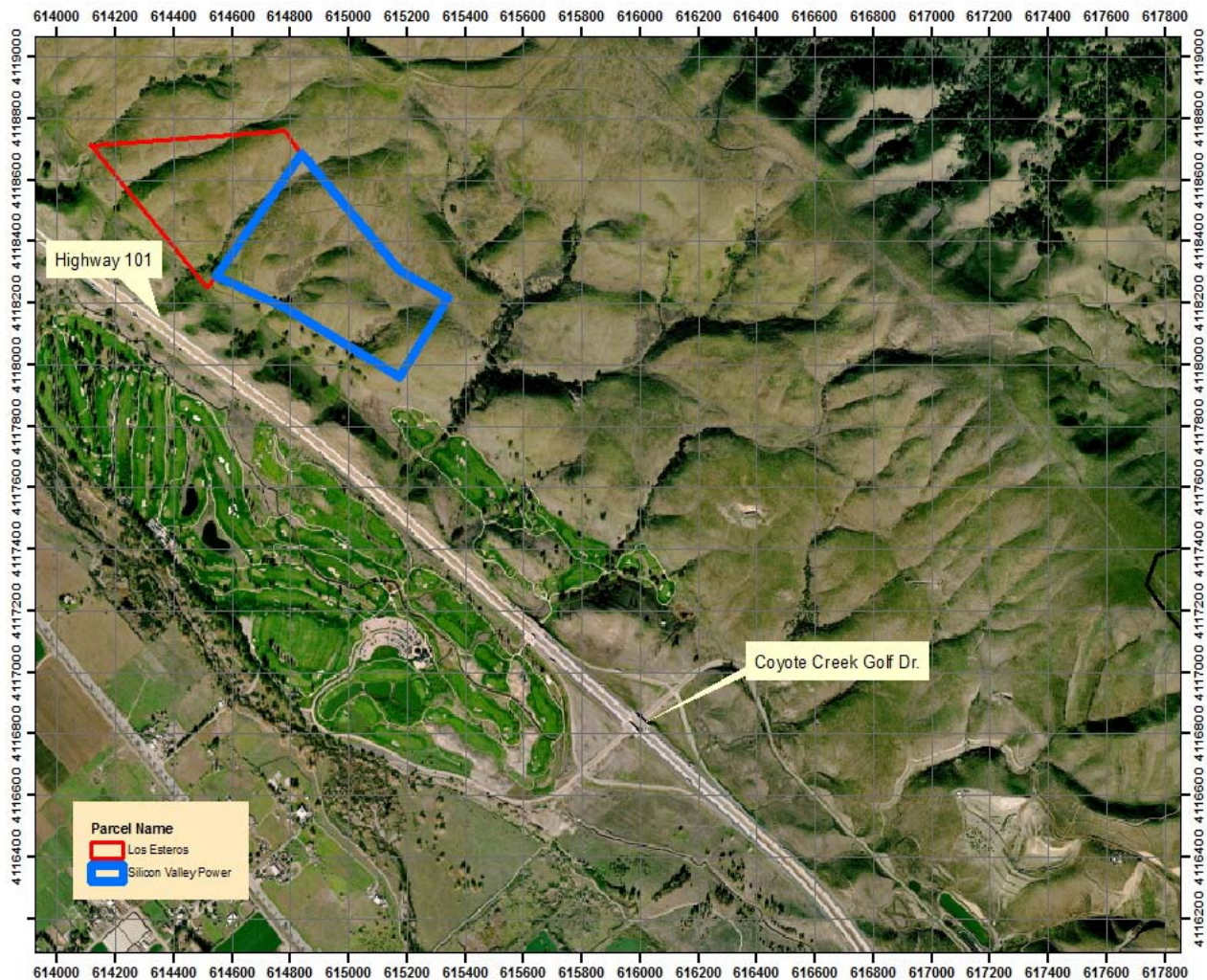


Figure 2. DVR Ecological Preserve



2.1.2 Brief Project Summary

The DVR is a natural gas-fired, combined-cycle electric generating facility rated at a nominal net generating capacity of 122-megawatts (MW), with the ability to peak-fire to 147 MW. All linear facilities, such as the sanitary sewer wastewater pipeline and natural gas pipeline, will be contained within the heavy industrial and light industrial portions of the City of Santa Clara.

The main DVR features are as follows:

- The DVR is a 122 MW nominal, natural gas-fired, combined-cycle generating plant with two General Electric LM-6000PC Sprint combustion turbine-generators (CTGs), a single condensing steam turbine generator (STG), a deaerating surface condenser, a mechanical draft plume-abated cooling tower, and associated support equipment.
- The CTGs are equipped with standard combustors, air inlet chilling, and heat recovery steam generators (HRSGs) with duct burners. The emission reduction system includes a selective

catalytic reduction (SCR) unit and water injection to control nitrogen oxides (NO_x) and an oxidation catalyst to control carbon monoxide (CO).

- An existing pipeline currently located within the boundaries of the DVR supplies tertiary-treated recycled waste water. The source of this water is the South Bay Water Recycling Program (SBWR), operated by the San Jose/Santa Clara Water Pollution Control Plant (WPCP), which is located in the City of Alviso.
- A 115-kilovolt (kV) on-site switchyard delivers the plant's power directly to the adjacent Kifer Receiving Station and the nearby Scott Receiving Station (located approximately 0.25 miles west of the site).

A gas compressor facility is located on City of Santa Clara property at the corner of Lafayette and Comstock streets, 500 feet from the DVR.

- Approximately 2.0 miles of 12-inch diameter underground natural gas pipeline conveys gas from Pacific Gas & Electric Company's (PG&E) gas distribution Line 132. This pipeline begins at the corner of Gianera Street and Wilcox Avenue, north of the DVR, and extends south along Lafayette to the gas compressor station located at the corner of Lafayette and Comstock.
- Approximately 500 feet of pipeline conveys compressed natural gas from the gas compressor station back to the DVR.
- Approximately 900 feet of 18-inch diameter underground pipeline conveys the DVR's waste water discharge from the DVR site south in Lafayette Avenue to a 27-inch waste water main in Central Expressway.
- The existing SVP NAJ-Kifer 60 kV line, located on the west side of the former Pico Way right-of-way, will be relocated to the eastern edge of the DVR, along Duane Avenue and Lafayette Street, before connecting to the Kifer Receiving Station

Biological resources will not be affected within a one-mile radius of the DVR and 1,000 feet on either side of all linear facilities. However, biological resources in the serpentine grasslands, located in the hills surrounding the Santa Clara Valley, could potentially be affected by nitrogen deposition resulting from NO_x emissions due to plant operation, and NH₃ emissions resulting from pollution control processes. The Service and the CEC have theorized that cumulative effects of nitrogen deposition from automobiles, power plants, and other emission sources facilitates the growth of non-native grasses, affecting densities of the host plants and nectar plants for the Bay checkerspot butterfly and other state and federally listed species (including four federally endangered plants) that are endemic to serpentine grasslands. The effect of nitrogen deposition on serpentine ecosystems, as well as modeling protocol, is discussed in detail in the biology section of the DVR Application for Certification (AFC; Silicon Valley Power, 2002), and summarized in Section 4.0.

2.2 Activities Covered by Permit

SVP requests coverage under the 10(a)(1)(B) permit (referred to as the “covered activities”) for operation of the DVR (for the estimated project life of 30 years).

These activities will also be discussed further by the Preserve Management Plan, a document that has a proposed finalization date of February 28, 2014.

Since the construction of the DVR Power Plant will not directly affect any federally listed species, the Covered Activities are restricted to the indirect effects (nitrogen deposition) and those monitoring and adaptive management methods necessary on the DVR Ecological Preserve to maintain the Bay Checkerspot butterfly population. The Preserve, which is immediately adjacent to other mitigation preserves specifically under management for the Bay Checkerspot butterfly, is under the same monitoring and management protocol as the neighboring parcels. These Covered Activities are as follows:

1. Nitrogen Deposition: The normal operations of the natural gas-fired DVR power plant produces emissions which may adversely affect local serpentine endemic wildlife and plant species through nitrogen deposition.
2. Vehicle Access: Access to the Preserve may result in take of the Bay checkerspot butterfly through vehicular collisions.
3. Monitoring: Seasonal and annual monitoring for BCB will consist of larval and adult surveys conducted at appropriate times of the year. Additionally, plant surveys will be conducted to determine availability of host and nectar plants, as well as percentage cover of invasive plants. Surveys and mapping of other listed plants and invasive plants will also take place. Some surveys will include permanent installation of plot markers (usually rebar). These surveys may incur take of BCB through trampling and pedestrian traffic through the host and nectar plants.
4. Grazing: The Preserve Management Plan includes a grazing strategy utilizing domestic livestock, which could utilize the approximately 40-acre protected serpentine grassland. The livestock will be allowed to periodically browse in the protected grassland for habitat management purposes. The Preserve Management Plan will include an adaptive management component to allow for changes in grazing animals, density of grazers, or to include mechanical removal (such as hand removal, use of weed eaters, trimmers, etc.) of non-native vegetation.
5. Road Maintenance: Little road maintenance is anticipated on the preserve, however some may occur in the form of grading or culvert replacement. Such work has potential to take BCB through vehicle collisions, or displaced dirt and rock killing host plants or BCBs in any life stage.
6. Invasive Weed Management: This task includes hand pulling, string cutting, hydromechanical obliteration, tarping, and flaming. Such activities may result in take of BCB through trampling, cutting, or other ground disturbance.

3.0 BIOLOGICAL SETTING

3.1 Characteristics of the Project Site and Surrounding Lands

The DVR is located within an urbanized part of the City of Santa Clara. Biological habitats within the DVR area consist primarily of urban landscapes with horticultural trees and shrubs, and open lots with ruderal vegetation. The DVR consists of the power plant and associated equipment. As described in the Biological Resources section of the DVR Application for Certification (AFC) (Section 8.2) (Silicon Valley Power, 2002), no sensitive biological habitats or wetlands and waters of the U.S. occur within the DVR. Additionally, the DVR does not contain habitats known to support special-status species.

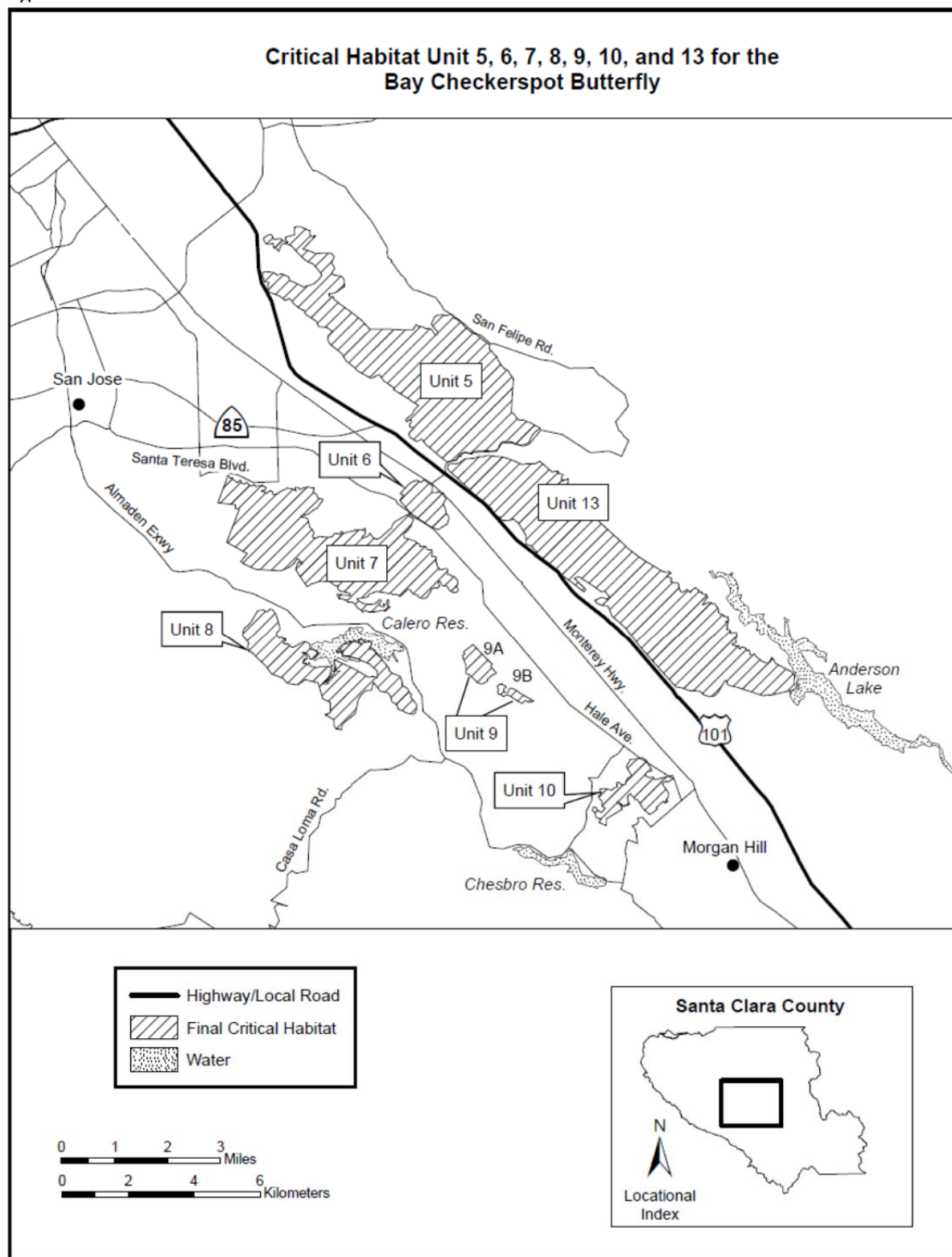
The area of potential effect includes a portion of the hills located east of Highway 101 and south of downtown San Jose that are collectively known as Coyote Ridge. Coyote Ridge contains some of the last remaining serpentine habitat within Santa Clara County. This habitat type supports native plant species that are only found on serpentine rock derived soils, including the four federally-endangered plant species. Additionally, the area of potential effect supports larval host plants and nectar plants for the Bay checkerspot butterfly and is designated as part of the 18,293-acre revised critical habitat for the Bay checkerspot butterfly (*Figure 3*). The mitigation parcel is located in Unit 13; Unit 5 on Coyote Ridge is comprised of serpentine habitat areas that support the four federally listed plant species, as well as the Bay checkerspot butterfly and its host and nectar plants, along with other biological resources in Santa Clara County, are shown in Figure 3. These serpentine habitat locations are based on the critical habitat units for Bay checkerspot butterfly (Service, 2008). However, this figure does not include all serpentine habitat or all areas where the Bay checkerspot butterfly or listed serpentine plant species occur within Santa Clara County.

3.2 Regional Biological Resources

The Santa Clara Valley and surrounding foothills are dominated by urban environments, oak woodland, annual grassland, and native bunchgrass prairie on serpentine soils. Community types in the DVR Ecological Preserve include urban environments with horticultural trees and shrubs, an urban riparian corridor, and open space/ruderal areas.

The Santa Clara Valley historically contained various habitats including riparian woodland, willow riparian woodland, sycamore alluvial woodland, emergent and vernal wetlands, and annual and perennial grasslands. Oak woodland, coastal sage scrub, and serpentine bunchgrass dominated the surrounding hills. Current land use is dominated by urban commercial/industrial development and urban residential development.

Figure 3 Locations of Critical Habitat



3.3 Description of Serpentine Bunchgrass Ecosystem

The DVR Ecological Preserve is part of a broader ecosystem that includes intact serpentine bunchgrass, non-serpentine grassland, riparian woodland, and oak woodland ecosystems. Coyote Ridge maintains the last remaining viable population of the Bay checkerspot butterfly following recent extinction events on the Stanford University Jasper Ridge preserve (McGarrah, 1997) and Edgewood Park, both in San Mateo County. However, a small population is being re-established at Edgewood as of 2012 (Weiss and Niederer, 2012). Coyote Ridge is also the largest and most intact tract of serpentine grassland in the Bay Area. Coyote Ridge is within designated critical habitat of the Bay checkerspot butterfly.

Protection and conservation of Coyote Ridge as part of critical habitat for the Bay checkerspot butterfly can also serve to protect habitat for other special-status species that occur along Coyote Ridge, including the San Joaquin kit fox, California red-legged frog, Burrowing Owl, Opler's long-horn moth, coyote ceanothus, Mt. Hamilton thistle, Santa Clara Valley dudleya, Metcalf canyon jewelflower, most beautiful jewelflower, and Tiburon paintbrush. See (*Table 2*) for more special-status species on the ridge.

3.3.1 Climate

The climate in the DVR area is temperate, and is influenced by the regional topography and proximity to the Pacific Ocean. The climate has a bimodal seasonal pattern with respect to rainfall and temperature. Summers are warm and dry, with the exception of morning overcast due to a marine inversion layer. Winters are wet and cool, with most rain occurring between October and March. Rainfall averages between 16 and 25 inches per year.

The Mediterranean climate influences the serpentine grassland ecosystem in several ways. First, summer dormancy is a predominant biological response of the species inhabiting the serpentine ecosystem, through seed set and desiccation of annual plants, summer dormancy of perennial plants, the diapause stage of the Bay checkerspot butterfly, and aestivation of some amphibian species. Therefore, a high degree of interannual variation in temperature and rainfall can affect survivorship and population trends over the long term. Second, disturbance patterns such as grazing are influenced by seasonal drying, creating potential management concerns in drought years.

3.3.2 Geology and Soils

The soils of the mitigation area consist of Montara clay loams. These soils are dark gray and very dark gray, moderately alkaline clay loam, underlain by greenish gray serpentine bedrock at a depth of 10 to 16 inches. Montara clay loams are somewhat excessively drained upland soils with 15 to 50 percent slopes, and rock outcrops covering 5 to 10 percent of the surface. Although erosion hazard is moderate to high, signs of accelerated erosion have not been observed at the site. Land uses on Montara soils are mainly range, wildlife, recreation, and watershed uses (USDA, 1974).

The serpentinite parent material that underlies the DVR Ecological Preserve is made up of a complex geology, with olivine, chrysolite, lizardite, and antigorite as the primary mineral constituents. Overall, chemical infertility is a limiting factor in plant response and growth, with alkalinity and nutrient toxicity playing a role as well. When weathered, these minerals produce serpentine soils that have the following characteristics: 1) exchangeable magnesium in higher

concentration than any other cation (*i.e.*, positively charged ion), 2) calcium levels usually lower than those found on non-serpentine soils, 3) levels of nitrogen, potassium, and phosphorous that are usually below those required for normal growth of crop plants, and 4) high concentrations of the heavy metals chromium and nickel, while molybdenum may be in amounts insufficient for normal growth (Kruckeberg, 1984). Serpentine soils may be slightly acidic to moderately alkaline, with the soils in the DVR Ecological Preserve area in the range of pH 8.0.

In addition to chemical factors, the physical factors of water stress and high temperatures play an important role in determining plant and animal responses to serpentine soils. In many cases, it is impossible to identify a single limiting factor, such as nitrogen; rather, the chemical, physical, and biotic characteristics of serpentine soils create a “serpentine syndrome” (Jenny, 1980, *cited in* Kruckeberg, 1984), allowing the evolution of the unique assemblages of serpentine endemic and near-endemic species. However, at Coyote Ridge and other Bay Area serpentine grasslands, nitrogen has been established as the limiting factor for non-native annual grasses; numerous studies are reviewed in Weiss (1999).

3.3.3 Vegetation

Vegetation at the DVR Ecological Preserve is dominated by serpentine bunchgrass, a diverse ecosystem with a high percent cover of native species. Species include native grasses and forbs, serpentine endemic and near endemic species, European grasses, and upland ruderal species (*Table 1*). Perennial bunchgrasses, such as purple needlegrass (*Stipa pulchra*), California barley (*Hordeum brachyantherum* ssp. *californicum*), and big squirreltail (*Elymus multisetus*) are well-represented, ranging from 0.6 to 2.5 percent cover. The native annual grass three-week fescue (*Vulpia microstachys*) is also present. Native forb species include California poppy (*Eschscholzia californica*), yarrow (*Achillea millefolium*), naked-stemmed buckwheat (*Eriogonum nudum* ssp. *nudum*), wild parsley (*Lomatium* spp.), tidy tips (*Layia* spp.), California goldfields (*Lasthenia californica*), serrated onion (*Allium serra*), and common muilla (*Muilla maritima*).

The DVR Ecological Preserve is high-quality habitat for the Bay checkerspot butterfly. The host plant, dwarf plantain (*Plantago erecta*), is common in the thin soils around rocks, but less common in deeper soils. Small stands of owl’s clover (*Castilleja* spp.) can be found dispersed throughout the property. In addition, the nectar sources such as wild parsley, California goldfields, tidy-tips, and common muilla are abundant. European grasses, including slender wild oats (*Avena barbata*), Italian ryegrass (*Festuca perennis*), and soft brome (*Bromus hordeaceus*), are common in the deeper soils. Ruderal species such as yellow starthistle (*Centaurea solstitialis*), black mustard (*Brassica nigra*), and filaree (*Erodium cicutarium*), are mostly restricted to disturbed sites, such as road shoulders.

Table 1. Plant Species Observed During Surveys at the DVR Ecological Preserve

Family	Species	Common name	N/I*
Apiaceae	<i>Lomatium</i> spp.	Parsley	
Asteraceae	<i>Achillea millefolium</i>	Yarrow	N
	<i>Aster</i> sp.		
	<i>Baccharis pilularis</i>	Coyote brush	N
	<i>Centaurea solstitialis</i>	Yellow starthistle	I
	<i>Cirsium fontinale</i> var. <i>campylon</i>	Mt. Hamilton thistle	N
	<i>Lasthenia californica</i>	California goldfields	N
	<i>Layia glandulosa</i>	White tidy tips	N
	<i>Layia platyglossa</i>	Yellow tidy tips	N

Family	Species	Common name	N/I*
	<i>Stephanomeria virgata</i> ssp. <i>plerocarpa</i>		N
Boraginaceae	<i>Amsinckia intermedia</i>	Intermediate fiddleneck	N
Brassicaceae	<i>Brassica nigra</i>	Black mustard	I
Ericaceae	<i>Arctostaphylos</i> sp.	Manzanita	N
Fabaceae	<i>Lupinus</i> sp.	Lupine	N
	<i>Trifolium</i> spp.	Clover	N
Geraniaceae	<i>Erodium cicutarium</i>	Filaree	I
	<i>Geranium dissectum</i>		I
Juncaceae	<i>Juncus</i> spp.	Rush	N
Liliaceae	<i>Allium serra</i>	Serrated onion	N
	<i>Muilla maritima</i>	Common muilla	N
Papaveraceae	<i>Eschscholzia californica</i>	California poppy	N
Plantaginaceae	<i>Plantago coronopus</i>	Buck's horn plantain	I
	<i>Plantago erecta</i>	Dwarf plantain	N
Poaceae	<i>Aira caryophyllea</i>	European hairgrass	I
	<i>Avena barbata</i>	Slender wild oat	I
	<i>Bromus madritensis</i> ssp. <i>rubens</i>	Foxtail brome	I
	<i>Bromus hordeaceus</i>	Soft chess	I
	sp.		
	<i>Festuca elmeri</i>	Wild-rye	N
	<i>Hordeum murinum</i> ssp. <i>leporium</i>	Hare barley	I
	<i>Hordeum brachyantherum</i> ssp. <i>californicum</i>	California barley	N
	<i>Festuca perennis</i>	Italian ryegrass	I
	<i>Stipa pulchra</i>	Purple needlegrass	N
	<i>Vulpia microstachys</i>	Three-week fescue	N
Polemoniaceae	<i>Leptosiphon adrosacens</i>	False babystars	N
Polygonaceae	<i>Eriogonum nudum</i> var. <i>nudum</i>	Naked-stemmed buckwheat	N
	<i>Eriogonum</i> sp. 2		
Primulaceae	<i>Anagallis arvensis</i>	Scarlet pimpernel	I
Schrophulariaceae	<i>Castilleja densiflora</i>	Common owl's clover	N
	<i>Castilleja exserta</i>	Purple owl's clover	N

*N/I: Native/Introduced

3.3.4 Wildlife

The habitat of the DVR Ecological Preserve is well-suited for mule deer (*Odocoileus hemionus*) and coyote (*Canis latrans*), and activity of both species was noted in the area. DVR Ecological Preserve is also listed as San Joaquin kit fox (*Vulpes macrotis mutica*) habitat by the CNDDDB (CDFG, 2004). Common small mammal species in the preserve area include voles (*Microtus*, *Clethrionomys*, sp.), field mice (*Peromyscus* sp.), California ground squirrels (*Spermophilus beecheyi*), and black-tailed jackrabbit (*Lepus californicus*), which provide forage for raptors. The local herd of Tule elk (*Cervus canadensis* ssp. *nannodes*) has been observed using the preserve area on occasion. Bobcat (*Lynx rufus*) and mountain lion (*Puma concolor*) use the ridge, although they have not been observed on the DVR Ecological Preserve (C. Edgerton, pers. comm. 2012).

Coyote Ridge provides a rich habitat for birds. Although not a complete list, the bird species observed in 2003 included the Common Raven (*Corvus corax*), gulls (*Larus* sp.), Mallard (*Anas platyrhynchos*), Northern Harrier (*Circus cyaneus*), Mourning Dove (*Zenaidura macroura*), Black Phoebe (*Sayornis nigricans*) and an unidentified flycatcher. Bird species observed in the adjacent golf course less than a mile away included a hawk (*Buteo* sp.), Killdeer (*Charadrius vociferus*), Pied-billed Grebe (*Podilymbus podiceps*), Greater White-fronted Goose (*Anser albifrons*), Great Egret (*Ardea alba*), European Starling (*Sturnus vulgaris*), Brewer's Blackbird (*Euphagus cyanocephalus*), and Brown-headed Cowbird (*Molothrus ater*). Burrowing Owls (*Athene cunicularia*) have been recorded in the mitigation

area; however, Burrowing Owls were not observed nor was there evidence of Burrowing Owl activity on the DVR Ecological Preserve. Golden Eagle (*Aquila chrysaetos*), Ferruginous Hawk (*Buteo regalis*), and Prairie Falcon (*Falco mexicanus*) have since been observed on the property (C. Edgerton, pers. comm. 2012).

California red-legged frogs (*Rana aurora draytonii*) have been documented in the pond area associated with the Kirby Canyon landfill (USFWS 2003, ICF International 2012); however, only western mosquito fish (*Gambusia affinis*) were observed in those wetlands during summer 2003 surveys conducted by Tetra Tech FW, Inc., biologists.

3.4 Special-Status Species in the Project and DVR Ecological Preserve Areas

Project Area: No special-status species are found in the project area. No sensitive biological habitats or wetlands and waters of the U.S. occur within the project area. Additionally, the project does not contain habitats known to support special-status species (Silicon Valley Power, 2002). Mitigation for this project is required not for direct effects to listed species, but for indirect effects caused by increased nitrogen deposition (Section 4.1.2).

DVR Ecological Area: The serpentine habitat in the Santa Clara Valley region is home to several special-status species. Five special-status plant species, the Mt. Hamilton thistle (*Cirsium fontinale* var. *campylon*), Santa Clara Valley dudleya (*Dudleya abramsii* ssp. *setchellii*), smooth lessingia (*Lessingia micradenia* var. *glabrata*), Metcalf Canyon jewelflower (*Streptanthus albidus* ssp. *albidus*), and most beautiful jewelflower (*Streptanthus albidus* ssp. *peramoenus*) occur in the DVR Ecological Preserve area. Two other special-status plant species, the Fragrant fritillary (*Fritillaria liliacea*) and Hall's bush mallow (*Malacothamnus hallii*), have the potential to occur, but were not observed during surveys in the DVR Ecological Preserve area (Table 2) (*see Table 2*). Additionally, the Bay checkerspot butterfly is known to occur along Coyote Ridge within, and in the vicinity, of the DVR Ecological Preserve area. Existing grazing regimes are proven compatible with persistence of these special-status species on Coyote Ridge. The lack of grazing should be considered a threat to the special-status species, because it allows invasive species to proliferate.

Table 2. Special-Status Plant Species Occurring in Coyote Ridge

Scientific Name	Common Name	Federal/ State/ CNPS ¹	Occurs in DVR Ecological Preserve? ²	Comments ³
<i>Castilleja affinis</i> ssp. <i>neglecta</i>	Tiburon Indian paintbrush	E/T/1B.2	No	Perennial herbaceous flower growing to 60 cm tall, blooms Apr-Jun. Found in rocky serpentine areas of valley and foothill grasslands at elevations between 75 and 400 m. Threats include overgrazing by cattle, gravel mining, and development.
<i>Ceanothus ferrisiae</i>	Coyote ceanothus	E/T/1B.1	No	Evergreen shrub growing to 2 m tall, blooms Jan-May. Found on dry slopes of chaparral and valley and foothill grasslands associated with serpentine soils at elevations less than 300 m. Threatened by overgrazing by cattle, dumping, fire management, and development, including expansion of Anderson Reservoir Spillway.

<i>Cirsium fontinale</i> var. <i>campylon</i>	Mt. Hamilton thistle	--/--/1B.2	Yes	Herbaceous perennial herb 60 to 200 cm, blooms Feb-Oct. Found in serpentine seeps in chaparral, cismontane woodland, and valley/foothill grassland at elevations between 100 and 890 m. Threatened by urbanization, trampling, and overgrazing.
<i>Dudleya abramsii</i> ssp. <i>setchellii</i>	Santa Clara Valley dudleya	E/--/1B.1	Yes	Perennial herbaceous flower with fleshy leaves and peduncle growing 5 to 20 cm, blooms Apr-Jun. Found in serpentine outcrops of valley and foothill grasslands and cismontane woodlands at elevations between 120 and 300 m. Threatened by urbanization/development, overgrazing by cattle, and off-road vehicles.
<i>Fritillaria liliacea</i>	Fragrant fritillary	--/--/1B.2	Potential	Bulbiferous perennial herb, blooms Feb-Apr. Often found in serpentine soils in cismontane woodland, coastal prairie, coastal scrub and valley/foothill grassland at elevations between 3 and 410 m. Threatened by overgrazing, agriculture, urbanization, and non-native plants.
<i>Lessingia</i> <i>micradenia</i> var. <i>glabrata</i>	Smooth lessingia	--/--/1B.2	Yes	Erect annual herb 5 to 60 cm, blooms Jul-Nov. Found in serpentine soils in chaparral and cismontane woodland, often in roadcuts. Occurs at elevations between 120 and 420 m.
<i>Malacothamnus</i> <i>hallii</i>	Hall's bush mallow	--/--/1B.2	Potential	Evergreen shrub, blooms May-Sep. Found in chaparral and coastal scrub at elevations between 10 and 760 m. Often found on serpentine soils.
<i>Streptanthus</i> <i>albidus</i> ssp. <i>albidus</i>	Metcalf Canyon jewelflower	E/--/1B.1	Potential	Annual herbaceous flower growing 50 to 120 cm tall, blooms Apr-Jul. Found in valley and foothill grasslands in open areas with serpentine soils at elevations between 150 and 800 m. Threatened by development and off-road vehicles.
<i>Streptanthus</i> <i>albidus</i> ssp. <i>peramoenus</i>	Most beautiful jewelflower	--/--/1B.2	Potential	Annual herb 20 to 80 cm, blooms Apr-Jun. Found in serpentine soils in chaparral, cismontane woodland and valley/foothill grassland at elevations between 120 and 1,000 m. Threatened by development and overgrazing.

¹ Status Categories:

State status determined from *Special Plants List* (June 1999), and/or *State and Federally Listed Endangered, Threatened, and Rare Plants of California* (April 2002), prepared by CDFG Natural Diversity DataBase. CNPS status determined from *CNPS Inventory of Rare and Endangered Vascular Plants of California*, online edition, accessed December 2012. Codes used in table are as follows:

E = Endangered; T = Threatened

CNPS List: 1B = Rare Threatened, or Endangered in CA and elsewhere; Threat Rank: 0.1-Seriously threatened in California (over 80% of occurrences threatened / high degree and immediacy of threat); 0.2-Fairly threatened in California (20-80% occurrences threatened / moderate degree and immediacy of threat)

² Source: CNDDDB/RareFind, September 2003.

³ Source: Hickman 1993, Tibor 2001.

3.5 The Bay Checkerspot Butterfly and Federally-Listed Serpentine Endemic Plants

Bay Checkerspot Butterfly

The Bay checkerspot butterfly (*Euphydryas editha bayensis*) is a medium-sized butterfly with a wingspan of about 2 inches (5 cm), with black bands along the veins on the upper wing surface and bright red, yellow, and white spots. It is a federally-listed threatened species that inhabits remnant patches of serpentine grassland in the San Francisco Peninsula and southern Santa Clara County. The Bay checkerspot butterfly may have once inhabited both serpentine and non-serpentine soils, prior to the conversion of native bunchgrass to non-native annual grassland. However, the dry, nutrient-poor, and sometimes toxic conditions found in serpentinized areas have impeded the invasion of weedy species. This has allowed for the persistence of native plants in these areas (Huenneke *et al.*, 1990),

including the host plants for the Bay checkerspot butterfly (*Plantago erecta*, *Castilleja densiflora*, and *Castilleja exserta*).

The Bay checkerspot butterfly currently persists as a meta-population (Ehrlich and Murphy, 1987), in which sub-populations exist in relative isolation, connected through low levels of dispersal. Local sub-population extinction and recolonization events are a natural part of regional meta-population dynamics, but Bay checkerspot butterfly populations have been going extinct at an increased rate over the past decade. The causal factors for the observed extinctions are unclear, but include increasing climate variability due to global warming (McLaughlin *et al.*, 2002), increasing urbanization and habitat fragmentation over the last century (Ehrlich and Murphy, 1987), and habitat degradation due to invasion by introduced European annual grasses (Weiss, 1999).

The life history and population biology of the Bay checkerspot butterfly has been well-studied. The larvae are dependent on the host plant dwarf plantain, with owl's clovers providing secondary forage for prepupa larvae. Adult nectar plants include desert parsley (*Lomatium* spp.), California goldfields (*Lasthenia californica*), tidy tips (*Layia* spp.), serrated onion (*Allium serra*), sea muilla (*Muilla maritima*), false babystars (*Leptosiphon androsaceus*), intermediate fiddleneck (*Amsinckia intermedia*), and other plant species (Service, 1998). These plants are most common on serpentine bunchgrass, being less common on valley and foothill grassland.

The Bay checkerspot butterfly must grow large enough to enter diapause before the plants senesce (mature and dry up) in the late spring to early summer. Weather conditions affect both the larvae and the host plants, with few larvae reaching diapause in extremely wet or dry years, causing population declines. While population levels subsequently increase during more favorable years, these fluctuations create a risk of Bay checkerspot butterfly population extirpations, especially during prolonged extreme weather events (Ehrlich and Murphy, 1987) such as the California drought of the mid-1970s or the El Niño weather of 1982-1983 and 1997-1998. Populations can fluctuate over two orders of magnitude (100-fold) over time – such fluctuations are a normal feature of Bay checkerspot populations. The response to weather is complicated and contingent on timing of rainfall and spring temperatures; populations can decline in wet years, or increase in dry years depending on the flight season of the butterfly (dependent on winter sunshine) and the senescence dates of hostplants (dependent on spring temperatures). Local topography buffers these responses because larval hostplants senesce weeks later on steep north-facing slopes than on flats and south-facing slopes (Weiss *et al.*, 1988).

Noting that rainfall had become increasingly variable, especially after 1971, McLaughlin *et al.* (2002) developed population models based on observed correlations between rainfall data and population fluctuations. They argued that the amplitude of population fluctuations has increased since 1971, causing a decrease in local population persistence rates. The Bay checkerspot butterfly has possibly persisted through previous periods of climatic variability due to greater habitat continuity and extent. However, some current populations persist as isolated remnants in a highly urbanized environment, and may face inevitable stochastic (random or chance events) extinction. The population complex on Coyote Ridge, with its high topographic diversity and complex spatial structure, is the greatest opportunity to secure the future of the butterfly.

Federally Listed Serpentine Endemic Plants

Four plant species that occur almost exclusively on serpentine soils have also been listed by the Service. These species are the federally endangered coyote ceanothus (*Ceanothus ferrisiae*), Metcalf Canyon jewelflower (*Streptanthus albidus* ssp. *albidus*), Santa Clara Valley dudleya (*Dudleya abramsii* ssp. *setchellii*), and the Tiburon paintbrush (*Castilleja affinis* ssp. *neglecta*).

Coyote ceanothus is an evergreen shrub in the buckthorn family (Rhamnaceae) with round leaves that are dark green and shiny on the upper surface and light green with minute hairs on the lower surface (Service, 1998). Coyote ceanothus grows to 1 to 2 meters high (3 to 6 feet). Leaf margins of coyote ceanothus are wavy to serrated and the base of the leaf tapers to the stem. The plant has small white flowers that are usually found in clusters. The fruit of coyote ceanothus is distinguished by three horns that protrude from the tip of the fruit (Hickman, 1993).

Coyote ceanothus is found on dry slopes of serpentine-based soils along hillsides in chaparral and in valley and foothill grasslands below 300 meters (approximately 1,000 feet) (Hickman, 1993; Service, 1998). Currently, coyote ceanothus is known from only four populations that occur in Santa Clara County: 1) Anderson Dam, with two populations 2) Kirby Canyon, and 3) Llagas Avenue, north of Morgan Hill (Service, 1998). The Anderson Dam populations are believed to be the largest population with near 5,000 plants. The species was also once thought to occur in San Mateo and Santa Cruz Counties; however, these reports were subsequently found to be erroneous (Service, 1998).

Coyote ceanothus is threatened by development, unauthorized dumping, landfill activities, cattle overgrazing, altered fire regimes, and stochastic events.

Metcalf Canyon jewelflower is an annual forb of the mustard family (Brassicaceae) that grows up to 1 meter (3.3 feet) in height. This plant has a pale green-grey color (glaucous) to its stem and leaves and has bristly hairs at the base of the stem. Upper stem leaves are linear to lanceolate with basal leaves appearing more oblanceolate and toothed. The flowers of the Metcalf Canyon jewelflower are produced from a raceme (long flower stem that produces flowers that open from bottom to top). The flowers consist of four sepals that are white to yellow to whitish-green with the three top sepals being fused and the bottom sepal being free and spreading. The petals of the jewelflower are white with brownish to purplish colored veins. *Streptanthus albidus* ssp. *albidus* is distinguishable from *Streptanthus albidus* ssp. *peramoenus* in that the latter subspecies has lavender to rose-purple colored sepals and purplish colored petals (Hickman, 1993).

Metcalf Canyon jewelflower occurs in serpentine outcroppings with little or thin soils within serpentine grasslands at elevations of 150-800 meters (495 to 2,640 feet) (Hickman, 1993). Rare plant species associated with Metcalf Canyon jewelflower include most beautiful jewelflower (*S. albidus* ssp. *peramoenus*), Mt. Hamilton thistle (*Cirsium fontinale* var. *campylon*) and Santa Clara Valley dudleya (*Dudleya abramsii* ssp. *setchellii*). Metcalf Canyon jewelflower is known only from an area of approximately 20 miles between San Jose and Anderson Reservoir (Service, 1998). Furthermore, the serpentine outcroppings where this species occurs are patchily distributed within the entire range of the species.

Metcalf Canyon jewelflower is primarily threatened by urban development. Metcalf Canyon jewelflower is known from a very limited distribution within a portion of Santa Clara County that is increasingly under development pressures from San Jose and Morgan Hill. Other less significant pressures that could threaten the survival of Metcalf Canyon jewelflower include overgrazing,

unauthorized dumping and recreational off-road activities.

An experiment with heavy to severe simulated herbivore damage of the conspecific most beautiful jewelflower showed that plants with moderate clipping (cut at half initial height) responded with compensatory growth, with significantly lower mortality and more fruits than unclipped plants. Plants with severe clipping (above first healthy leaf) did not recover, and had significantly higher mortality than unclipped plants. The plants readily branch and, unlike the dudleya, send out new inflorescence branches in response to loss of the apex. Stems and leaves are similarly colored, the leaves are rather small and sparse, and the stems may be photosynthetically active, all of which mean that clipping even two-thirds of the leaves is not a very severe event for *S. a. peramoenus*. Metcalf Canyon jewelflower is such a closely related plant that it is expected to react similarly to similar treatments (Weiss *et al.*, 2007).

Santa Clara Valley dudleya is a perennial plant of the stonecrop family (Crassulaceae). Santa Clara Valley dudleya is a low-growing plant with fleshy, triangular to oblong glaucous leaves (similar in appearance to ice plant). Flowers are attached to two or three flowering stems that may branch 1 time and reach a height of 5 to 20 centimeters (2 to 8 inches). The flowers are a pale yellow color and have five petals (Hickman, 1993; Service, 1998).

Santa Clara Valley dudleya is found in serpentine grasslands from 120-300 meters (390 to 990 feet) in elevation. Additionally, this species is further restricted to the immediate vicinity of rocky outcrops of serpentine material. Santa Clara Valley dudleya extend roots into crevices of rocky outcrops and are only found around outcrops with crevices of sufficient depth (15 centimeters/6 inches) (Service, 1998). Santa Clara Valley dudleya is limited geographically to areas of serpentine outcrops from the area of San Jose to San Martin (Service, 1998).

Santa Clara Valley dudleya is restricted to the Coyote Valley portion of Santa Clara County. As such, the primary threat to survival of this species is urban development. Competition from non-native species is also a threat (Service, 1998). Other possible threats could come from landfill activities and quarry expansion in the area west of Anderson Reservoir, unauthorized dumping and recreational off-road activities. While cattle do occasionally graze Santa Clara Valley dudleya, their impact appears minor in moderately grazed systems. Density of Santa Clara Valley dudleyas was measured in paired quadrats on either side of a 1.2 km fence dividing grazed and ungrazed habitat, and no significant difference was found. Dudleya inflorescences on the ungrazed side did tend to be slightly but significantly taller, which data suggest translates into a small increase in seed output (Weiss *et al.*, 2007).

Tiburon paintbrush is a semi-woody perennial belonging to the snapdragon family (Scrophulariaceae). Tiburon paintbrush has erect stems that can be many branched, and all stems are covered in soft hairs. This plant grows from 30-60 centimeters (1 to 2 feet) in height. The leaves of the Tiburon paintbrush are lanceolate and possess up to 5 lobes. Flowers of this plant are yellowish to red in color and floral bracts (a small leaf- or scale-like structure generally subtending a branch, peduncle, pedicel, or flower) are conspicuous and yellowish, sometimes with red tips (Hickman, 1993; Service, 1998).

Tiburon paintbrush occurs in serpentine bunchgrass communities on slopes between 75 and 400 meters (250 and 1,300 feet) elevation. In Santa Clara County, Tiburon paintbrush occurs in close proximity to Santa Clara Valley dudleya (Service, 1998). Tiburon paintbrush is known from eight

populations. Five of these occur in Marin County (three of which are on the Tiburon Peninsula), one occurs in the American Canyon (Napa County), and two occur in the vicinity of Anderson Reservoir in Santa Clara County.

The Tiburon paintbrush populations in Santa Clara County (approximately 1,000 plants) occur almost exclusively on private land, grazed by cattle. Recorded declines in one population appear to be associated with rabbit herbivory (Weiss 2011). An herbivore exclusion and enhancement experiment, which will include seeding and plug planting (defined as transplantation from a nursery bed, greenhouse, or other location to an outside area) is underway in the Kirby Canyon Butterfly Preserve. This project is directed by Creekside Center for Earth Observation and funded by the Central Valley Project Conservation Program.

4.0 EFFECTS/TAKE ASSESSMENT

This section describes the potential effects to the Bay checkerspot butterfly and four federally-listed plants due to operation of the DVR. This section also forms the basis for a Section 10(a)(1)(B) consultation with the Service.

4.1 Impacts Assessment

4.1.1 Direct Impacts

Direct effects to Bay checkerspot butterfly and the four federally-listed plants will not occur from operation of the DVR. The DVR is located within a commercial, urbanized portion of the City of Santa Clara. No habitat for Bay checkerspot butterfly and the four federally listed plants occurs within the DVR Power Plant area that will be directly affected. Furthermore, no habitat for other special-status species or sensitive biological communities occurs in the DVR Power Plant area.

4.1.2 Indirect Impacts

The Service and the CEC have stated that nitrogen emissions from cars, power plants and other industrial sources have led to degraded conditions in serpentine grassland ecosystems, which may adversely affect the Bay checkerspot butterfly as well as the four federally listed plants. Increased NO_x emissions from cars and other industrial sources, which enrich the nutrient-poor serpentine soils, have been cited as the primary factor in non-native grass invasions (Weiss, 1999).

Single chemical constituents, nutrient or deficient, have often been cited to account for the unique soil conditions and vegetation found on soils weathered from the blue-green serpentine rock. However, the chemical, physical and biotic properties of serpentine soils must be viewed as a complex of interacting factors, or the “serpentine syndrome” (Kruckeberg, 1984). Properties of serpentine soils include: 1) high levels of minerals such as calcium, aluminum, nickel, chromium, and magnesium, 2) low levels of essential nutrients such as phosphorous and nitrogen, 3) sparse plant cover, and 4) high heat and moisture stress. A suite of serpentine-endemic species has evolved that can tolerate these adverse conditions, often restricted to serpentine soils because they are out-competed in other environments. Nitrogen deposition, therefore, must be viewed as a contributing factor to explain the observed invasion by non-native grasses.

Weiss (1999) reviewed the scientific literature on nitrogen fertilization in these particular serpentine soils; they showed that nitrogen was the primary limiting nutrient for growth of non-native annual grasses. More recent work has established a critical load for serpentine grassland at 6 kg-N ha⁻¹ yr⁻¹. The estimated rate of nitrogen deposition in South San Jose ranges from 8 to 20 kg N/ha-yr, depending on the proximity to the urban area and large highways, especially Highway 101 (Weiss, 1999, Fenn *et al.* 2010).

Based on analysis and review of several other power plant AFCs, the Service and CEC have concluded that although nitrogen deposition from power plant emissions may have minor effects on the soils that support host and nectar plants for butterflies and other serpentine endemic plant species (including the four federally-listed plants), the cause-and-effect relationship that would show that indirect effects were occurring would be difficult to prove for several reasons (Silicon Valley

Power, 2002). These reasons include the distance between the power plant and the area of potential effects, the relatively minute average depositional rate of emissions from the power plants, the number of other nitrate sources in the intervening area and the conservative nature of the air impact modeling (see discussion below in Section 4.2). Therefore, the DVR would not have a significant adverse indirect effect on the Bay checkerspot butterfly or other serpentine endemic species.

More recent analyses of nitrogen deposition impacts on Coyote Ridge are available in the Santa Clara Valley Habitat Conservation Plan (ICF, 2012).

4.1.3 Cumulative Impacts

The CEC and Service have required power plants projects in the Santa Clara Valley to assess the effects of their projects on serpentine endemic species under cumulative effects circumstances. Power plant projects located in the Santa Clara Valley include the Metcalf Energy Center (MEC), Los Esteros Critical Energy Facility (LECEF) and the DVR.

Although these agencies determined that nitrogen deposition from power plants could not (individually) be shown to have significant effects on serpentine endemic species, they concluded that air dispersion modeling (for each project) did show some level of nitrogen deposition above background conditions. The agencies therefore concluded that when combined with traffic estimates from the U.S. Highway 101 expansion, the other power plants in the airshed and background conditions, emissions from the DVR were reasonably certain to have a cumulative adverse effect on serpentine endemic species (Silicon Valley Power, 2002).

As noted above, however, the individual contributions of these power plants are increases of fractions of a percent above the background/ambient deposition. Although it may be debatable whether the fractional increases actually will cause any additional acceleration in annual plant invasion, this plan mitigates for the potential that this may occur. Please see Section 5.0 for a discussion of the mitigation measures.

4.2 Take Assessment

Cumulative increases in nitrogen deposition, from cars, power plants, and other industrial sources have been considered to result in increased growth of non-native grasses. This is particularly the case in nitrogen limiting soils that support mostly endemic plant species, such as serpentine soils. As non-native grass populations increase, these grasses compete with native grasses and forbs for light, water, and other resources. The non-native grasses can essentially take over the system, replacing the native grasses and forbs (including the host and nectar plants for the Bay checkerspot butterfly). As host and nectar plant populations decrease, the number of post-diapause larvae and adult butterflies also decrease, which would constitute “take.”

Based on the determination that the DVR could have potential cumulative effects on serpentine endemic species, an assessment of the level of “take” was conducted for Bay checkerspot butterfly. However, the nature of the effects is such that for the nitrogen deposition to have an effect on butterflies, the following conditions would have to be met:

- 1) The deposition would occur on serpentine or serpentine-like soils.
- 2) The soils would support host and/or adult nectar plants for the butterflies.

- 3) The host and/or nectar plants would be threatened with population decreases or decreased vigor due to increase in percent cover and biomass of annual grasses.

Because the DVR's effect level is calculated as a fraction, which is the DVR's percentage contribution to the total nitrogen background deposition rate, it is nearly impossible to directly quantify the number of butterflies affected per gram of nitrogen deposited. All Bay checkerspot butterflies within the SVP 40 acres of serpentine grasslands will be taken in the form of harm and harassment. As described in Section 1.2, Section 9 of the Act does not strictly prohibit incidental take of plant species; therefore, take assessments of these species were not performed.

The estimation of "take" can be calculated as the ratio of the average deposition rate of the DVR to the background deposition rate, and multiplied by the total acres potentially affected. In terms of the DVR, "take" was calculated by first identifying the total acres potentially impacted. In 2008, the Service designated 13 critical habitat units for Bay checkerspot butterfly (Service, 2001). Therefore, although the total area designated by the Service is over 21,000 acres, only a portion of this is actually serpentine habitat and therefore sensitive to nitrogen deposition. Dr. Stuart Weiss has calculated the actual area of serpentine habitat at approximately 10,306 acres.

Secondly, to determine potential effects and therefore some estimation of "take," it is necessary to obtain the background deposition rate in the local region (ambient nitrogen deposition without the DVR) and the average deposition rate of emissions from the DVR. The average background deposition rate was calculated as 8.4 kg/ha-yr by Dr. Stuart Weiss and was agreed upon in meetings between Service, Dr. Weiss and several power plant proponents. However, there are a number of "hot spots" that range in the 15-20 kg N/ha/yr and these include portions of Coyote Ridge and Tulare Hill. The average deposition rate of emissions from the DVR was calculated using the Industrial Source Complex Short Term model, version 3 (ISCST3) air dispersion model. ISCST3 is a steady-state, mass-conserving, nonreactive (*i.e.*, no chemistry) Gaussian plume dispersion model. All of the DVR turbines were modeled to assess nitrogen impacts. In addition, NO_x emission controls were added to the existing turbine in order to reduce existing facility emissions from present baseline. As such, the existing turbine emissions, prior to the addition of controls, were modeled to establish baseline (Silicon Valley Power, 2002).

To produce conservative results (overestimate the effects), modeling assumptions regarding the complex chemistry that occurs to produce nitrogen from NO_x, ammonia, and other pollutants were used in this analysis. For example, it was assumed that the pollutants leaving the stack(s) were already in the form of depositional nitrogen (nitrate and ammonium ions). Thus, all effects represented 100 percent conversion of combustion emissions into depositional nitrogen. This assumption led to an exceedingly conservative estimation of nitrogen deposition, because areas with the highest nitrogen emissions did not necessarily experience the greatest deposition effects, which usually occur far from the original nitrogen source. In addition, since mass is conserved in the model, all downwind calculations of nitrogen deposition, regardless of distance and formation rates, were overestimated by the model.

The ISCST3 model calculates atmospheric deposition of nitrogen by calculating the wet and dry fluxes of total nitrogen. This deposition is accomplished by using a resistance model for the dry deposition part, and by assigning scavenging coefficients for the wet removal process from rainout. Depositional parameters are input into the model in order to calculate the deposition of nitrogen.

Additional discussion of nitrogen deposition mechanisms and modeling inputs can be found in the Biological Resources section of the DVR AFC (Silicon Valley Power, 2002).

Table 3 shows the average deposition rate of emissions from the DVR, based on the ISCST3 model.

Table 3. Estimated Potential Effects Acreage

	A	B	C	D	E
Critical Habitat Unit	Unit Acres (Service)	Acres of serpentine habitat (Weiss)	Average deposition (kg/ha-yr) ¹	DVR deposition as a percent of background ²	Effects acreage ³
Bear Ranch Unit	283	59.9	0.0136	0.0016	0.0975
Communication Hill	0	170	0.0941	0.0112	1.9045
Kalana Hills	226	106.4	0.0370	0.0044	0.4689
Kirby	5,446	2,753.9	0.0288	0.0034	9.4709
Morgan Hill	507	361.9	0.0268	0.0031	1.1569
Metcalf Unit	3,019	1,158.4	0.0372	0.0044	5.1334
San Felipe	659	597.69	0.0259	0.0030	1.8437
Silver Creek	825	576.21	0.0575	0.0068	3.9496
San Vicente-Calero	1,543	520	0.0271	0.0032	1.6821
San Martin	467	201.4	0.0212	0.0025	0.5088
Santa Teresa Hills	3,278	1,209.4	0.0409	0.0048	5.8934
Tulare Hill	348	347.4	0.0478	0.0056	1.9774
Total (acres)	16,601	8,062.58			34.0876
Serpentine not in Critical Habitat		2,243	0.0382	0.0045	10.2011
New Total (acres)		10,305.20			44.2888

¹Average deposition per habitat unit, from ISCST3 stack emissions and meteorological model.
²Background deposition is 8.4 kg/ha-yr, so D = C/8.4.
³Effects acreage is calculated as critical habitat unit acres times DVR deposition as a percent of background (E=B*D)

To then calculate the “take,” one must obtain the ratio between the average deposition rate and the background deposition rate (average deposition rate divided by background [8.4 kg/ha-yr]). Then, take that ratio of deposition rate and multiply by the number of acres affected (9,926) to establish the impacted acreage or “take.” For the DVR, “take” of Bay checkerspot butterfly was calculated to be approximately 40 acres of habitat. It should be noted again that this is an extremely conservative value based on an extremely conservative modeling process. This take estimate is additionally conservative considering the difficulty of demonstrating that additional fractions of a percent of nitrogen deposition over existing background could have any demonstrable effect on annual grass growth, annual grass expansion, and reduction in Bay checkerspot butterfly host plants and, consequently, Bay checkerspot butterflies.

5.0 CONSERVATION STRATEGY

5.1 Biological Goals and Objectives

This HCP is designed to reduce potential cumulative impacts to Bay checkerspot butterfly and federally-listed serpentine plants from the DVR to less-than-significant levels. The biological goals for this HCP are as follows:

- To protect populations of Bay Checkerspot butterfly and federally listed serpentine plants by establishing the DVR Ecological Preserve.
- To protect, manage, and maintain/improve the existing habitat for Bay checkerspot butterfly and federally listed serpentine plants at the DVR Ecological Preserve.

The objectives of this goal are:

- To acquire and establish a 40-acre property as a permanent DVR Ecological Preserve for Bay Checkerspot butterfly and federally listed serpentine plants.
- To establish and fund an endowment for management of the DVR Ecological Preserve in perpetuity.
- Reduce ambient NO_x through the purchase of air pollution credits.
- To monitor the DVR Ecological Preserve for plant composition, including cover of butterfly host and nectar sources, non-native grasses, invasive weeds, and serpentine endemic plants.
- To minimize the spread of invasive weeds and non-native annual grasses in locations where they can have negative effects on the host and nectar plants for butterflies and on the listed endemic plants.
- To manage the DVR Ecological Preserve through controlled grazing.
- To maintain a grazing lease on the 40-acre DVR Ecological Preserve in perpetuity.

To accomplish the first goal, this HCP proposes to formally designate an existing 40-acre property (*i.e.*, the DVR Ecological Preserve) as a permanent preservation area for Bay checkerspot butterfly and federally listed serpentine plants. DVR has also established and funded an endowment for management of the preservation area in perpetuity.

This goal will also be accomplished by monitoring the populations of Bay checkerspot butterflies and the federally listed serpentine plants, as they occur on the DVR Ecological Preserve (see section 5.5 below). This information will be integrated with data from adjacent and nearby preserves to help make sound decisions for specific management of the DVR Ecological Preserve and for the overall management of the designated Critical Habitat and other suitable areas for these listed species on Coyote Ridge. To accomplish the second goal, management of the preservation area includes

monitoring for plant composition, including cover of butterfly host and nectar sources, non-native grass, invasive weeds, and serpentine endemic plants.

Furthermore, preservation area managers will minimize the spread of invasive weeds and non-native annual grasses in locations where they may have negative effects on the host and nectar plants for butterflies and on the listed endemic plants. This objective is accomplished through a cattle grazing lease with closely controlled grazing on the 40-acre preservation area in perpetuity.

Serpentine grasslands are notoriously variable in plant composition from year to year, making it difficult to set reasonable habitat goals. Yearly snapshots can be potentially misleading, and only long-term data can provide estimates of the variability inherent in the ecosystem in response to weather, topography, nitrogen (N)-deposition, and resource management. Table 4 shows key habitat values for the Kirby Canyon Butterfly Preserve (also on Coyote Ridge), which provides the benchmark for high quality Bay checkerspot butterfly habitat. These data give us Kirby Canyon's historical range of variability, plus the values for spring 2012. These data can be compared against historical and spring 2012 data for the DVR Ecological Preserve. The table shows that the DVR Ecological Preserve generally has lower habitat quality than Kirby Canyon. This is typical of lower elevation sites on Coyote Ridge, which generally are drier, hotter, and receive higher loads of dry nitrogen deposition. Bay checkerspot meta-populations at these lower elevations are smaller and more likely to disappear and recolonize than they are at the more stable, higher elevation sites like Kirby Canyon.

Table 4. Historical and current habitat parameters at Kirby Canyon and the DVR Ecological Preserve

	<i>Plantago erecta</i> cover	<i>Castilleja</i> spp. cover	<i>Lasthenia californica</i> cover	<i>Allium serra</i> cover	<i>Muilla maritima</i> cover	<i>Layia</i> spp. cover	Annual grass cover	Thatch cover
Kirby Canyon 2001-2012	1.9%-13.5%	0.06%-0.5%	2.2%-13.2%	0-0.1%	0.7-2.0%	0.3-2.1%	7.7%-24.6%	0-2.4%
Kirby Canyon 2012	6.5%	0.07%	2.2%	0.07%	2.0%	0.3%	13.8%	1.4%
DVR 2005-2012	1.2-7.8%	0-0.1%	0.2-1.8%	0-0.1%	0.2-1.5%	0.2-0.7%	11.8-48.2%	1.1-20.9%
DVR 2012	1.6%	0	0.2%	0.04	1.1%	0.1%	11.8%	17.7%

Based on historical data, the following targets must be reached on the DVR Ecological Preserve in five of ten years to be considered within compliance (*Table 5*). Targets may be revised if monitoring determines that populations of the Bay checkerspot butterfly are not stable or increasing over baseline estimates over a 10 year average.

Table 5. DVR Ecological Preserve Habitat Objectives

	<i>Plantago erecta</i> minimum cover	<i>Castilleja</i> spp. minimum cover	<i>Lasthenia californica</i> minimum cover	<i>Allium serra</i> minimum cover	<i>Muilla maritima</i> minimum cover	<i>Layia</i> spp. minimum cover	Annual grass maximum cover	Thatch maximum cover
Objective	1%	Present on site	0.5%	Present on site	Present on site	Present on site	35%	20%
Objective met in 2012?	Yes	n/a	No	Yes	Yes	Yes	Yes	Yes
Objective met since 2005?	8 of 8 years	n/a	5 of 8 years	n/a	Yes	Yes	6 of 8 years	7 of 8 years

n/a = Not found in sampling plots, but likely present on site.

5.2 Mitigation Measures

To mitigate the potential cumulative effects to Bay checkerspot butterfly and federally listed serpentine plants from operation of the DVR, SVP proposes the following measures:

- Acquisition of and placement of a conservation easement on a 40-acre parcel of serpentine habitat to be managed in perpetuity, called the DVR Ecological Preserve, for the serpentine-endemic species. Monitoring and adaptive management for the Bay checkerspot butterfly and federally listed plants will occur on the DVR Ecological Preserve (per sections 6.1.2 and 6.1.3, as well as the Preserve Management Plan) on an annual basis.
- Purchase of Bay Area Air Quality Management District (BAAQMD) air pollution credits for NO_x. Prior to the initial operation of DVR, SVP purchased emission reduction credit certificates in the amount of 43.3 tons of Nitrogen Oxides. These credits will help offset and reduce the effects of nitrogen deposition on serpentine plant species not found on the 40-acre conservation site (see *Table 2* for a list of these species).
- A qualified biologist (Service-approved) will conduct the monitoring and management of the DVR Ecological Preserve.

5.2.1 Mitigation Area

The DVR Ecological Preserve is located on Coyote Ridge in the Santa Clara Valley, just north of the junction of Highway 101 and Coyote Creek Golf Drive. The DVR Ecological Preserve is part of a larger property, owned by Castle & Cooke, Inc., which spans a portion of the Coyote Ridge from the Anderson Reservoir to Highway 101. The approximately 3,123 acre property, which contains habitat for the Bay checkerspot butterfly, the California red-legged frog, Santa Clara Valley dudleya, and Mt. Hamilton thistle, is being converted to mitigation land (*see Figure 4*). The 40-acre parcel acquired by SVP to mitigate for the DVR's potential effects is located at the northern end of the Castle and Cooke property, adjacent to a 40-acre preserve previously established by Calpine Corporation in conjunction with the Los Esteros Energy Center project.

While this DVR Ecological Preserve occurs within the San Jose city limits, the DVR Ecological Preserve is outside of the urban growth boundary. According to the City of San Jose General Plan (2004), a major component of the growth management strategy is the establishment of the Greenline/Urban Growth Boundary. The Greenline/Urban Growth Boundary is intended to develop clearer identity for San Jose by defining where the City begins and ends and to preserve valuable open space resources. The key elements of the Greenline/Urban Growth Boundary are the hillsides, the baylands, and the rural/agricultural area in the south Coyote Valley. The open space lands preserved under the Greenline/Urban Growth Boundary Strategy serve as environmental preserves for the protection of wildlife habitat, watersheds, and natural ecosystems.

The hillsides are the most extensive and visually prominent feature addressed as part of the Greenline/Urban Growth Boundary strategy. Planned uses in the hillsides include valuable watersheds, wildlife habitat areas and rangelands for agriculture and grazing. Thus, the hillsides (and the DVR Ecological Preserve) are not likely planned for rural or urban development and will not likely be within the planned urban growth zone.

Additionally, as mentioned above, approximately 1,421 acres of the 3,123 acre Castle and Cooke property have been converted to mitigation lands. As such, these lands have been purchased and are being managed as open space preserves. Thus, the DVR Ecological Preserve will not be threatened by development surrounding the site, as it is within and surrounded by other preserved lands. Additionally, SVP has donated the 40-acre DVR Ecological Preserve to the Silicon Valley Land Conservancy (formerly known as the Land Trust for Santa Clara County) and has set up an endowment for the Land Conservancy to manage the property in perpetuity. It is the goal of SVP and the Silicon Valley Land Conservancy to maintain this land as open space, regardless of whether butterflies and/or listed plant species persist on-site in the future.

Surveys of the DVR Ecological Preserve were conducted by biologists from Tetra Tech FW, Inc., consultant to SVP, in December 2002, and May, June, and December 2003. Host and nectar plants for Bay checkerspot butterfly were observed growing throughout the DVR Ecological Preserve and populations of Mt. Hamilton thistle were also observed. Dr. Stuart Weiss, and additional staff from Creekside Center for Earth Observation, have conducted monitoring since 2005, and have documented the presence of Santa Clara Valley dudleya, most beautiful jewelflower, and smooth lessingia (Weiss and Quenelle, 2009; Staci Markos, pers. comm. 2012).

Based on morphology, a 2005 survey of the Coyote Ridge, of which the DVR Ecological Preserve is a part, 79% of *Streptanthus* plants were identified as ssp. *peramoenus*, 20% were intermediate, and 1% was ssp. *albidus*. Typically, Metcalf Canyon jewelflower has been identified by the all-white sepals, where most beautiful jewelflower are usually pink. More recent taxonomic work by Justen Whittall at Santa Clara University (Whittall, pers. comm., 2013) suggests that small numbers of white plants intermixed with other pink individuals be call. *S. a. peramoenus*.

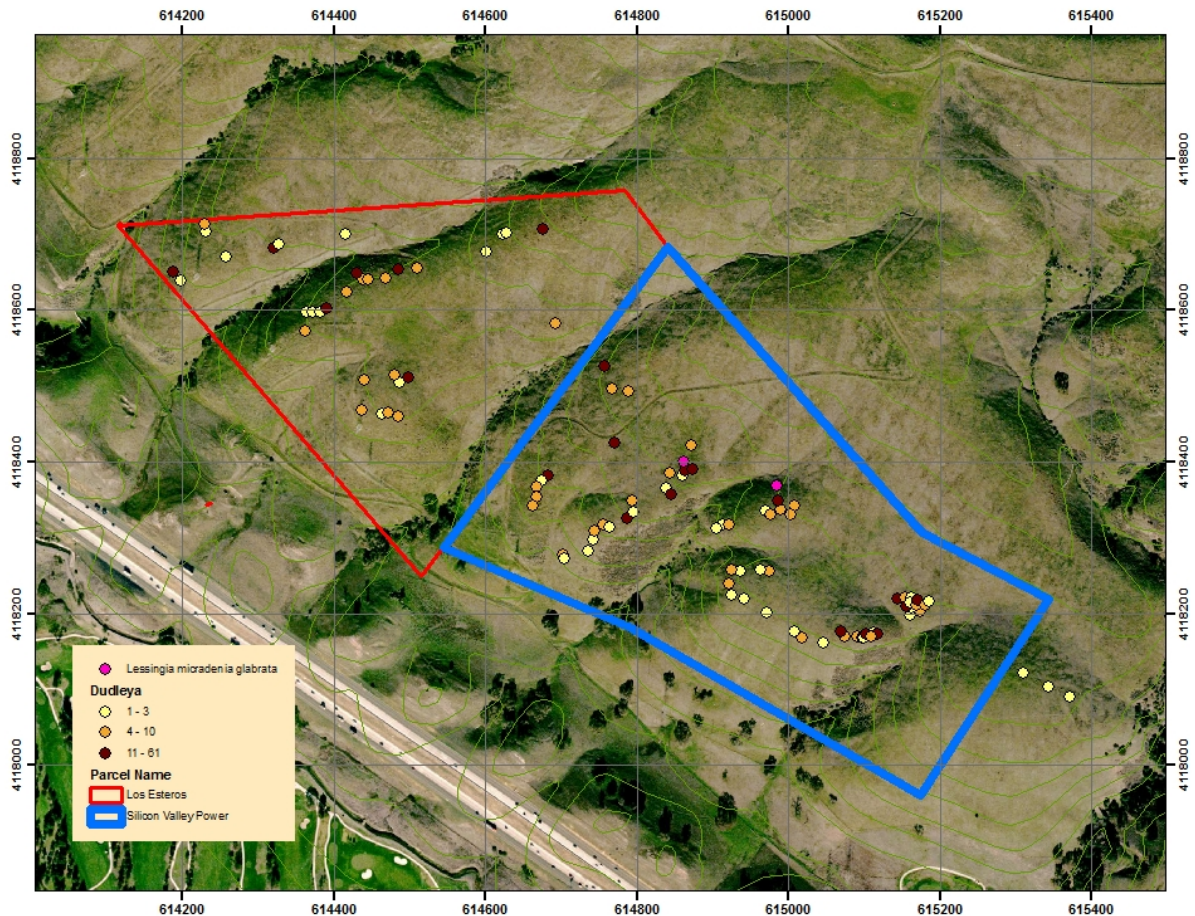
The first edition of the Jepson Manual (Hickman 1993) recognized most beautiful jewelflower (*Streptanthus albidus* ssp. *peramoenus*) and Metcalf Canyon jewelflower (*Streptanthus albidus* ssp. *albidus*). The second edition of the Jepson Manual (Baldwin et al. 2012) lumped most beautiful jewelflower with a more common taxon, bristly jewelflower (*Streptanthus glandulosus* ssp. *glandulosus*). Metcalf Canyon jewelflower was retained as a distinct taxa, *Streptanthus glandulosus* ssp. *albidus*.

Creekside biologists and other observers are not entirely satisfied with new *Streptanthus* taxonomic designations found in the second edition of the Jepson Manual. We feel the Coyote Ridge phenotype (with distinct sepal colors) is intermediate between *Streptanthus glandulosus* ssp. *glandulosus* and *Streptanthus glandulosus* ssp. *albidus*. Molecular research by Dr. Justen Whittall of Santa Clara University supports this position. Based on his findings and other comments, the CNPS inventory will retain the taxonomic nomenclature from the first edition of the Jepson Manual. This means that the Metcalf Canyon jewelflower and the most beautiful jewelflower will remain in CNPS list 1B and retain the same protection under California environmental statutes they previously held.

Metcalf Canyon jewelflower and the most beautiful jewelflower appear to hybridize on Coyote Ridge. The Metcalf Canyon jewelflower has white sepals, and the most beautiful jewelflower has pink sepals, ranging from a deep pink to quite pale. Occasionally a small number of white-sepaled individuals are found within larger populations of pink-sepaled plants. Dr. Whittall hypothesizes there is a hybrid zone between Metcalf Canyon jewelflower and most beautiful jewelflower (or what may be historically be bristly jewelflower) starting somewhere approximately around the Kirby landfill extending to the north on Coyote Ridge to its historical range limit at Communications Hill, with most beautiful jewelflower and bristly jewelflower being south of Kirby and westward. This could be tested with molecular markers, but Whittall states the sepal color (which is the only consistently distinguishing trait besides geography) is indicative of a broad hybrid zone. Until such testing is done, he recommends that anything south of Metcalf Road that has a predominance of sepals with pigment should be called most beautiful jewelflower. Single white-sepalled individuals in a mixed colony are unlikely reproductively isolated from the pinks, and therefore should not be recognized as taxonomically distinct (Whittall, pers. comm., 2013).

Surveys and mapping are planned in 2014 to determine whether there are any large stands of pure white plants that might be considered Metcalf Canyon jewelflower.

Figure 4. Biological resources associated with the DVR Ecological Preserve. Bay checkerspot butterfly habitat, including host and nectar sources, is included throughout both marked parcels. Mount Hamilton thistle is located in many of the drainages but is not mapped. Most beautiful jewelflower (and perhaps Metcalf Canyon jewelflower) is present but unmapped.



6.0 CONSERVATION PLAN IMPLEMENTATION

6.1 Preserve Management

Management of serpentine grasslands has two primary purposes. First, an increase in biomass due to the proliferation of European annual grasses could lead to an accumulation of soil organic matter, causing a long-term increase in soil nitrogen. Removal of nitrogen from the system (through active site management) is necessary for restoration of ecosystem health and the long-term maintenance of serpentine bunchgrass species.

Second, experience with management and restoration of California native grasses has shown that grasslands dominated by European annuals do not readily succeed towards diverse perennial bunchgrass ecosystems (George *et. al.*, 1992; Bartolome and Gemmill, 1981). Although vegetative diversity and native species dominance remains high on Coyote Ridge, European annual grass species have become naturalized and will persist even under management designed to remove nitrogen over the long term. Management tools need to be designed to effectively control European annual grass percent cover and biomass, and reduce competition with the host and nectar plants of the Bay checkerspot butterfly and other serpentine endemic plants. Such tools include herbivory (grazing) in grasslands, removing standing biomass and thatch, recycling nutrients, and shifting the competitive balance between annual grasses and native bunchgrass and forb species.

Special-Status Plant Management

Special-status plant responses to grazing are species-specific. For example, many special-status species respond positively to low-intensity, short-duration grazing due to reduction in competition from non-native grasses, yet decline with the trampling and soil compaction associated with high-intensity grazing.

Two of the federally-listed plants species have been observed within the DVR Ecological Preserve. Therefore monitoring programs will be implemented to track population trends and implement contingency measures, if necessary, to ensure long-term population viability. Similar programs will be implemented if the other two plants with potential to occur at the DVR Ecological Preserve become established. Other sensitive plants, such as smooth lessingia and Mt. Hamilton thistle, are also found at the DVR Ecological Preserve and apparently have been successfully propagating under the current grazing regime.

Weed Management

Based on surveys of the DVR Ecological Preserve in May and June 2003, invasive annual grasses observed in the site include Italian ryegrass (*Festuca perennis*), soft chess (*Bromus hordeaceus*) and barley (*Hordeum murinum* ssp. *leporinum*). Additionally, two non-native annual species occur on the DVR Ecological Preserve and could become problematic if the correct environmental factors were provided. These species are the black mustard (*Brassica nigra*) and yellow star-thistle (*Centaurea solstitialis*). A third non-native annual species, barbed goatgrass (*Aegilops triuncialis*) has not been found on the DVR site; however, it's on the adjacent Los Esteros property, where it is being treated. Monitoring of encroachment onto the DVR site is ongoing.

At present, these species are associated with disturbed areas and road cuts. However, should moderate to substantial erosion occur on-site or should the site become disturbed, these species could become more established and would then also compete with non-native annual grasses and native species for soil, light and water resources. Since no populations of these two species occur within the main portion of the site, host and nectar plants and listed serpentine-endemic plants are not significantly affected by these species. Vegetative monitoring, as detailed below, will be conducted annually and will indicate what species are occurring within the sample transects. If monitoring (over the course of several monitoring events) shows that there is an increase in populations of these two species within the sample transects, SVP will follow the adaptive management strategy on invasive weed control.

Bay Checkerspot Butterfly Management

The primary driver in Bay checkerspot butterfly management is habitat acquisition and management. However, even with effective habitat management, populations can vary greatly between years. Bay checkerspot butterflies have a high fecundity, mortality, and sensitivity to weather and other conditions; population fluctuations, some on the scale of 100-fold or more, are commonplace. Therefore, the response of Bay checkerspot butterfly populations to habitat management tools such as grazing can only be measured by evaluating long-term, as well as regional, trends.

An active-adaptive Bay checkerspot butterfly monitoring plan, similar to the plans developed for the Kirby Canyon Landfill and Metcalf Energy Center, has been developed and is discussed below.

6.1.1 Grazing

European annual grasses can compete with native grasses and forbs for space, light and soil nutrients in the winter and spring, and for soil moisture in late spring and summer months (Menke, 1992; Holmes and Rice, 1996; Borman *et. al.*, 1991; Larson and McInnis, 1989). In addition, as the annual grasses senesce in the summer, the dead material accumulates as thatch on the soil surface, which can suppress the germination and survival of broadleaf species (Heady, 1956; Meyer and Schiffman, 1999).

Grazing has long been recognized as a powerful management tool for restoration of native grasslands in California (Menke, 1992), reducing competition and preventing the buildup of a dense thatch layer. This is especially important in serpentine grasslands, as cattle are known to selectively graze the palatable annual grasses over forbs such as dwarf plantain, owl's clover, and several wildflower species that serve as Bay checkerspot butterfly nectar plants (Weiss, 1999; Menke, 1992). In addition, Weiss (1999) has hypothesized that cattle can remove a small amount of nitrogen from serpentine grasslands as N is volatilized and/or leached from urine and dung, and as animals are removed for slaughter.

On the DVR Ecological Preserve, free-ranging light intensity/medium duration grazing is the primary management tool. It is important to note that though a parcel or group of parcels may be subject to the same grazing regime, actual grazing pressures experienced within these areas are different. In addition, any individual property is being managed within the greater context of adjacent properties, as well as the entire serpentine grassland ecosystem. The flexibility of ranchers to move their animals to other pastures when conditions warrant is appreciated, and has created a rich mosaic of habitat conditions across Coyote Ridge. Multiple, flexible grazing regimes across

pastures allow the ranchers to maximize the removal of grass biomass, which creates moderate disturbance, reduced competition, and bare soil for annual forbs to thrive. The results of such management are amply illustrated by the diversity and high cover of wildflowers across the range of serpentine grasslands being moderately grazed, including the Tulare Hill and Coyote Ridge mitigation parcels for the Metcalf Energy Center, the Los Esteros Critical Energy Facility and Valley Transportation Authority-San Jose, as well as UTC (United Technology Corporation) properties (CH2MHill *et al.*, 2011).

Based on ongoing grazing regimes in other serpentine areas within Santa Clara County, grazing at about 1 cow/calf per 10 acres during about half the year has been shown to have positive effects on the host and nectar plants for Bay checkerspot butterfly (Land Trust for Santa Clara County, 2004; CH2MHill *et al.*, 2011).

From 2001 to 2006, rancher Justin Fields maintained a summer-fall regime at the larger 1000-acre pasture that includes the 40-acre DVR Ecological Preserve, generally introducing his cattle in May (sometimes earlier) and grazing them there through October or November depending on grass availability and quality. In 2007, Fields had his cattle on the DVR Ecological Preserve for the spring and fall; in 2008 and 2009 he had cattle on the preserve for the spring and summer. In 2010 and 2011, relatively cool and wet conditions allowed him to increase his grazing time to spring through fall. In 2012, he grazed spring and fall (Weiss, 2006; Weiss and Quenelle, 2009; CH2MHill *et al.*, 2011).

The timing of grazing will be adjusted depending on annual weather patterns (*e.g.*, removing cattle early in drought years). Under these grazing conditions, the habitat benefits outweigh the low levels of mortality induced by potentially trampling larvae during the winter/spring period. SVP will provide an endowment such that this grazing management regime can continue on the DVR Ecological Preserve in perpetuity.

6.1.2 Adaptive Management

Adaptive management will be utilized at the DVR Ecological Preserve to address changing conditions that could occur at the site due to management, climatic or other environmental variations. An adaptive management strategy was developed for the site to determine actions to be taken should the biological goals and objectives listed in Section 5.0 not be met under the proposed management strategy.

This adaptive management strategy will be centered on two components: 1) monitoring of the vegetation and populations of Bay checkerspot butterflies, and 2) changes in grazing regimes. Grazing stock rates at the DVR Ecological Preserve will be determined by the preserve managers, guided by an experienced rancher's visual assessment of the site conditions. Additionally, stock rate decisions will be based on trends observed from monitoring data. Based on ongoing grazing activities on serpentine habitats within Santa Clara County, a regime of about 1 cow/calf per 10 acres has been shown to balance the needs of conservation with the needs of cattle ranchers. The exact numbers may fluctuate slightly to adjust to weather conditions and the ranchers' needs for flexibility. This regime has been shown to provide enough forage for cattle to gain desired weight and promote growth of native plants including the host and nectar plants for Bay checkerspot butterfly (Land Trust for Santa Clara County, 2004). However, just as environmental factors change from season-to-season and year-to-year, annual grass and Bay checkerspot host and nectar plant

growth varies in response to those environmental factors. Therefore, vegetation will be monitored to assess percent cover of native species and non-native annual grasses and native species diversity. Should results of monitoring show a 25 percent increase in non-native annual grass cover over all transects, concomitant with a proportional reduction in host and nectar plant percent cover, the adaptive management strategy will be to increase grazing (increase head of cattle/acre) on the site for one or a number of years as appropriate. Should results of monitoring show an overall 25 percent decrease in total percent cover (native species and non-native grass species), or should results show an increase in bare ground cover by 25 percent over all transects, this could signify over-grazing or a trend towards it. The adaptive management strategy for this condition would be to decrease grazing (decrease head of cattle/acre) on the site for one or a number of years as appropriate. This adaptive management plan is also shown in (Table 4). Adaptive management strategies associated with changed circumstances are described in Section 9.0.

Table 4 Adaptive Management Plan Responses

Monitoring result change from baseline condition	Adaptive Management Strategy
Increase in percent cover of non-native grasses by 25% over all transects concomitant with a proportional reduction in host and nectar plant percentages	Increase grazing pressure (more head/acre)
Decrease in total percent cover by 25% over all transects/increase in bare ground cover by 25% over all transects	Decrease grazing pressure (less head/acre)

Another adaptive strategy will be implemented if populations of the listed plant species are discovered on the DVR Ecological Preserve. If this occurs, steps will be taken to protect plants over the long term.

Additional adaptive management alternatives such as vegetation mowing, fire and irrigation were explored. The DVR Ecological Preserve is located along the hills, east of Highway 101. Elevation at the DVR Ecological Preserve ranges between 183 and 232 meters (600 and 760 feet). Mowing the DVR Ecological Preserve, for vegetation management, would be impractical due to the steep and rocky terrain. Likewise, using fire to adjust vegetation percent cover would be difficult to manage. Fire is also difficult to manage from a permitting perspective. Burns scheduled at Edgewood National Preserve in 2002 were not executed due to unpredictability of weather and then due to directive from California Department of Forestry and Fire Protection (CDF). Regional prescribed fire attempts continue to encounter permitting issues. Mowing and hay removal are not feasible because of rock outcrops and steep slopes. Finally, irrigation of the DVR Ecological Preserve (during a long drought) would also be impractical due to the high cost of setting up a functional irrigation system for what could be a short period of time. An adequate source of water does not exist on-site to provide the necessary volume of water that would be needed for regular irrigation. A water delivery pipeline, pumps, and distribution system would need to be set up on the DVR Ecological Preserve. Cattle might also damage an irrigation system. While these alternatives seem impractical now, they may be revisited if conditions change or additional information in their favor is found.

6.1.3 Monitoring

Vegetation

There is a high degree of interannual variation of Bay checkerspot butterfly host plant and non-native grass cover, depending on climatic variability and grazing management. The purpose of the monitoring will be to track long-term, rather than short-term, changes. Monitoring data can be used to adjust grazing regimes. Nesting the vegetation monitoring transects with the Bay checkerspot butterfly larval count plots will aid in the generation of regional correlation data on the relationship between host plant densities and larval densities.

Vegetation monitoring will be accomplished by using a standard methodology used on serpentine sites throughout the San Francisco Bay Area including the Edgewood Natural Preserve and the Metcalf Energy Center Ecological Preserve. The methodology for vegetation monitoring is described as follows:

- Four 50 m transects are established within the DVR Ecological Preserve. The ends of the transects will be marked with rebar for repeat sampling.
- Every 5 m, a 25 cm² plot will be established for a total of 10 plots per transect.
- In each plot, the percent cover of the host plants, nectar plants, native grasses, and non-native grasses, as well as percent cover of bare ground or rock outcrops will be tallied by use of a scale (0, 1, 2, 5, 10, 20, 30...90%).
- Percent cover will be tallied per species and by total groups (host plants, nectar plants, etc.).
- Richness (number of species per quadrat) will also be recorded.
- Vegetation will be sampled in the spring of each monitoring year to capture peak bloom of Bay checkerspot host plants and nectar sources.

Bay Checkerspot Butterfly

Topographic diversity significantly influences prediapause larval survival rates by providing a range of habitats and timing for host plants to germinate. Due to varying degrees of solar radiation, the development rate of both the butterfly and the host plants can vary by as much as a month from the cool north facing slopes and the warm south facing slopes (Murphy and Weiss, 1988a, b; Weiss, 1999). In most drought or mean rainfall years, survivorship will be highest in the protected north facing slopes where senescence of the annual dwarf plantain occurs later in the season, and the prediapause larvae have more time to enter diapause. In cool and moderately wet years, however, population increases will occur due to favorable conditions on south slopes (Ehrlich and Murphy, 1987; Weiss *et al.* 1988). Thus, sampling for population monitoring must be stratified by slope to get an accurate picture of population levels.

Quantitative assessment of successful colonization/habitat use by the Bay checkerspot butterfly is difficult due to a lengthy larval diapause period (sometimes up to 1 year). In addition, there are extreme population fluctuations, with population crashes often occurring in a period of 1 to 3 years (Weiss, 1999). It is therefore difficult to track trends over the short-term, determine the cause of population declines (*e.g.*, climatic fluctuations or habitat conditions), and adjust management in time to avoid population crashes. Therefore, Bay checkerspot butterfly monitoring is most appropriate as a long-term management tool, used to evaluate long-term responses to climate and more importantly, variables under human influence such as habitat condition.

Methods used to survey larval Bay checkerspot butterflies occurring in the DVR Ecological Preserve will be the same as the survey methods used in the nearby 250-acre preserve that is currently managed for the Bay checkerspot butterfly and listed serpentine plants already established on Coyote Ridge for the Kirby Canyon Landfill. The timing of the surveys will also be coordinated with surveys on other parcels. The monitoring methodology will include:

- Six 1,500 to 2,000 m² plots located on representative slopes present in the DVR Ecological Preserve.
- Each plot will be sampled with a series of timed counts (10 person-minutes per plot) in early spring (February 15 to April 15). Using a regression developed through work at the Kirby Canyon landfill mitigation site, the timed counts can be converted to larvae per unit area (assuming low numbers, correlation is 1 larvae/10 minutes = ~ 100/ha [247.11/acre]).
- Observations of adult butterflies in flight will be made in the late winter to early spring (generally starting in late February and ending in early May), if larvae are not detected.
- Monitoring will be conducted by a Service-approved biologist(s).

6.1.4 Reports

The monitoring year will occur from September to August. The annual monitoring report will be prepared and submitted to the U.S. Fish and Wildlife Service Sacramento Office and the California Energy Commission by January 30 of the following monitoring year. Copies of the 2006 and 2009 reports are included in (*see Appendix B*).

Baseline data will be collected for the first three years following DVR initiation and seasonally as (*Table 5*) depicts. Monitoring data will be collected every year and a report will be generated every three years for the life of the DVR as in other sites on Coyote Ridge. With this methodology, several monitoring data points will be generated for DVR Ecological Preserve in any given year.

Table 5 DVR Ecological Preserve Baseline Data Collection Schedule

Activity	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug
1. Larval counts	--	--	--	--	--	X	X	X	--	--	--	--
2. Adult butterfly observations	--	--	--	--	--	--	--	X	X	--	--	--
3. Vegetation sampling	--	--	--	--	--	--	X	X	X	--	--	--

6.2 Responsibilities

As specified in the Service's Habitat Conservation Planning Handbook (1996), an Implementing Agreement (IA) is not required for low-effect HCPs unless requested by the permit applicant. SVP understands that it is responsible for implementing this HCP in accordance with the specifications for mitigation, monitoring, reporting, and funding described herein and will perform all obligations assigned to it within the Section 10 permit and the HCP.

6.3 Scope

This HCP applies to all serpentine grasslands within the DVR air shed.

6.4 Permit Holder

SVP will be the permit holder:

Applicant:

John C. Roukema, Director of Electric Utility
Silicon Valley Power
City of Santa Clara
1500 Warburton Avenue
Santa Clara, CA 95054
(408) 261-5490

6.5 Access

Biologists from the Service shall be given complete access to the DVR Ecological Preserve site, as well as to the Bay checkerspot butterfly habitat areas on Coyote Ridge.

6.6 Permit Amendments/Renewal Process

6.6.1 Permit Amendments

Amendment of the DVR Section 10(a)(1)(B) permit would be required for any change in the following: (a) significant revision of the permit area boundary; (b) the listing under the Act of a new species not currently addressed in the HCP that may be taken by DVR activities; (c) modification of any important DVR action or mitigation component under the HCP, including funding, that may significantly affect authorized take levels, effects of the DVR, or the nature or scope of the mitigation programs; and (d) any other modification of the DVR likely to result in significant adverse effects to Bay checkerspot butterfly not addressed in the original HCP and permit application.

Amendment of the Section 10(a)(1)(B) permit would be treated in the same manner as an original permit application. Low-effect HCP permit amendments typically require a revised HCP, a permit application form and application fee, and a 30-day public comment period. However, the specific documentation needed in support of a permit amendment may vary, depending on the nature of the

amendment.

6.6.2 HCP Amendments

An HCP may, under certain circumstances, be amended without amending the associated permit, provided that such amendments are of a minor or technical nature and that the effect on the species involved and the levels of take resulting from the amendment are not significantly different than those described in the original HCP.

To amend the HCP without amending the permit, SVP must submit to the Service, in writing, a description of: (1) the proposed amendment, (2) an explanation of why the amendment is necessary or desirable, and (3) an explanation of why SVP believes the effects of the proposed amendment would not be significantly different than those described in the original HCP. The HCP amendment shall be considered effective upon the date of the Service's written authorization.

6.6.3 Permit Renewal

Upon expiration, the Section 10(a)(1)(B) permit may be renewed without the issuance of a new permit, provided that the permit is renewable, and that biological circumstances and other pertinent factors affecting the Bay checkerspot butterfly are not significantly different than those described in the original HCP. To renew the permit, SVP shall submit to the Service, in writing: (1) a request to renew the permit, (2) reference to the original permit number, (3) certification that all statements and information provided in the original HCP and permit application, together with any approved HCP amendments, are still true and correct, and inclusion of a list of changes, (4) a description of any take that has occurred under the existing permit, and (5) a description of any portions of the DVR still to be completed, if applicable, or activities under the original permit the renewal is intended to cover.

If the Service concurs with the information provided in the request, it shall renew the permit consistent with permit renewal procedures required by federal regulation (50 CFR 13.22). If SVP files a renewal request and the request is on file with the issuing Service office at least 30 days prior to the permit's expiration, the permit shall remain valid while the renewal is being processed, provided the existing permit is renewable. However, SVP may not take listed species beyond the authorization by the original permit. If SVP fails to file a renewal request within 30 days prior to permit expiration, the permit shall become invalid upon expiration.

6.7 Public Input

Under the Act, provisions are made for public review and comment for all HCPs. In general, there is a 60-day public comment period for HCPs. Low-effect HCPs and HCP amendments have a 30-day public comment period. Public comment periods typically begin after the Service and/or NMFS notify the public of the availability of the HCP for review. The notification occurs in the Federal Register and, when practicable, the Service and NMFS will seek to announce the availability of the HCP in local newspapers and in electronic formats.

7.0 FUNDING

The following actions were initiated as part of the guarantee of management in perpetuity and to provide assurances of funding for such management in perpetuity. SVP has reached an agreement with the Silicon Valley Land Conservancy (formerly known as Land Trust for Santa Clara County) for management of the mitigation land associated with this HCP. SVP has purchased 40 acres of mitigation land from Castle & Cooke, Inc. The purchase price is \$1,000,000. The Silicon Valley Land Conservancy currently manages the mitigation land and will implement the HCP in perpetuity. SVP, in turn, purchased the land on behalf of the Land Conservancy and placed \$250,000 in an endowment account that will be used to fund operating costs in perpetuity. SVP will also provide the Land Conservancy with \$50,000 in an operating account to fund short-term expenses such as capital improvements and other initial tasks. Annual deposits may be required by SVP to the Land Conservancy to cover any operating account deficiency incurred as a result of its obligations implementing the HCP.

These costs were determined by the Land Conservancy based on their existing operation of similar sites in the vicinity and include ongoing tasks such as biotic surveys and reporting, general maintenance, exotic plant control and office operations. The agreement provides for changes in the site circumstances with a provision whereby either party can cause the other to consult and revise the agreement (*i.e.*, funding). Stipulated reasons for revising the agreement include “proposed changes, increased costs, additional tasks, or other matters related to the adaptation of practices under the Habitat Conservation Plan.” The agreement further provides for SVP to reclaim the mitigation land should the Land Conservancy default on its obligations under the agreement.

8.0 ALTERNATIVES

A “no project” alternative was considered and rejected. The “no project” alternative failed to meet the basic project objectives of the DVR project. For example, the “no project” alternative is inconsistent with one of the primary objectives of SVP’s program to provide electrical power to its business customers and to replace the power obtained through a long-term sales agreement that expired in 2005, after the DVR came on line. In addition, the “no project” alternative could result in greater fuel consumption and air pollution in the state, because older, less efficient plants with higher air emissions would continue to generate power instead of being replaced with cleaner, more efficient plants, such as the DVR. Also, during limited availability of in-state generated electricity, imported electrical energy has proven to be expensive and not always available.

Additionally, under the “no-project” alternative, the DVR would not be built and the 40-acre DVR Ecological Preserve for serpentine endemic species would not be acquired or set up for management in perpetuity.

Similarly, alternative routes for the natural gas pipeline, electric transmission line, and waste water pipeline were also reviewed and found either to be infeasible, to fail to avoid or minimize any potential significant environmental effects, or to have the potential to cause significant environmental effects that are otherwise avoided or minimized by the DVR.

Various alternative technologies, scaled to meet the DVR objectives, with the technology of the DVR were compared. Technologies examined were those principal electricity generation technologies that do not burn natural gas: solar, wind and biomass. Both solar and wind generation result in the absence or reduction in air pollutant emissions, visible plumes, and need for emissions control. Water consumption for both wind and solar generation is substantially less than for a natural, gas-fired plant because there is no thermal cooling requirement.

However, solar and wind resources would require large land areas in order to generate 122 megawatts of electricity. Specifically, central receiver solar thermal projects require approximately 5 acres per megawatt; therefore, 122 megawatts would require approximately 610 acres, or over 200 times the amount of land area taken by the DVR site and linear facilities. Parabolic trough solar thermal technology requires similar acreage per megawatt. Wind generation “farms” generally require between 5 to 17 acres per megawatt, with 122 megawatts requiring between 610 and 2,074 acres. Additionally, solar and wind energy technologies cannot provide full-time availability due to the natural intermittent availability of the source.

Although air emissions are significantly reduced or eliminated for both wind and solar facilities, both can have significant visual effects. Wind facilities can also affect birds, depending on the turbine technology.

For biomass generation, a fuel source such as wood chips (the preferred source) or agricultural waste is necessary. Biomass facilities generate substantially greater quantities of air pollutant emissions. In addition, biomass plants are typically sized to generate less than 20 MW, which is substantially less than the capacity of the 122 MW DVR project. In order to generate 122 MW, six biomass facilities each generating 20 MW would be required.

Because of the typically lower efficiencies and intermittent availability of alternative generation technologies, they do not fulfill a basic objective of this plant: to provide power from a load-following facility to meet the growing demands for reliable power within the City of Santa Clara. Consequently, the Staff concluded that geothermal, hydroelectric, solar, wind and biomass technologies do not present feasible alternatives to the DVR.

A detailed alternatives analysis is provided in Section 9.0 of the DVR AFC (Silicon Valley Power, 2002).

9.0 CHANGED AND UNFORESEEN CIRCUMSTANCES

9.1 Changed Circumstances

Section 10 regulations [50 CFR 17.22 (b)(2)(iii)] require that an HCP specify the procedures to be used for dealing with changed or unforeseen circumstances that may arise during the implementation of the HCP. In addition, the Habitat Conservation Plan Assurances ("No Surprises") Rule [50 CFR 17.21 (b)(5)-(6) and 17.22 (b)(5)-(6); 63 F.R. 8859] defines "unforeseen circumstances" and "changed circumstances" and describes the obligations of the permittee and the Service.

The purpose of the Assurances Rule is to provide assurances to non-Federal landowners participating in habitat conservation planning under the Act that no additional land restrictions or financial compensation will be required for species adequately covered by a properly implemented HCP, in light of changed or unforeseen circumstances, without the consent of the permittee. "Changed circumstances" means changes in circumstances affecting a species or geographic area covered by the conservation plan that can reasonably be anticipated by plan developers and the Service and that can be planned for (*e.g.*, the listing of a new species, fire, increased precipitation, drought, and minor erosion). The policy defines "unforeseen circumstances" as changes in circumstances that affect a species or geographic area covered by the HCP that could not reasonably be anticipated by plan developers and the Service at the time of the plan's negotiation and development and that result in a substantial and adverse change in status of the covered species (*e.g.*, natural catastrophic events).

The changed circumstances for this site are reasonably foreseeable events such as fires, floods, or droughts that have an effect on habitat requiring a management response. These items are addressed below.

Fire

Fire has been documented in Santa Clara County as occurring on average every 2 years (SCV Final HCP, p. 10).

Adaptive Management Response: Fire would reduce thatch and/or grass cover of the site but is not expected to have detrimental effects to Bay checkerspot butterfly habitat. The reduced grass cover would result in less cattle forage. Consequently, the management response would be to evaluate the extent of the fire, the reduction in forage availability and then to adjust cattle grazing intensity and grazing period for the observed conditions. Other options may include (1) reseed with native species, (2) implement erosion control measures, (3) implement prescribed fires to reduce intensity and duration of wildfires, and (4) establish fire breaks.

Floods and High-intensity Rainstorms

Floods will not affect the site because its slope is sufficiently high to prevent flooding except for minor flow height increases in the small existing channels on the slope. No surface erosion is apparent at the site, despite many years of cattle grazing. Consequently, a substantial erosion event is considered to be potentially associated only with a long-return interval, high-intensity rainstorm

probably greater than a 100-year event (Ellen and Wieczorek, 1988). Such an event would have a probability of occurrence of less than 1/100 per year over the life of the DVR.

Adaptive Management Response: The site does not exhibit any apparent surface erosion effects despite substantial rainfall events in the recent past (*e.g.*, in 1982 [Ellen and Wieczorek, 1988] and in 1996 and 1998 [San Francisco Estuary Institute, 2001, Figure 15]). Additionally, no mass movements were identified at the site associated with the 1982 event and the landslides mapped in the serpentine units are associated with larger, steep inner canyons (Ellen and Wieczorek, 1988) that do not occur on the site. If any erosion prohibits site access via the dirt roads, then road repair should be expedited to resume road access.

Drought

Over the last several centuries there have been both protracted and short interval droughts in the Bay Area (*e.g.*, San Francisco Estuary Institute, 2001, Figure 13). Over the last hundred years dry periods from about 1944 to 1968 with relatively wetter periods from 1968 to 1995 but with a drought period from 1987 to 1992 (Roos, 1995) have been observed (Inman and Jenkins, 1999) plus the substantial precipitation events in 1996 and 1998 (San Francisco Estuary Institute, 2001, Figures 13, 14, 15). Therefore, dry conditions are likely to occur during the 30-year permit period. However, the periods of drought this site is likely to experience are not out of the ordinary and are within the range of conditions and variability the local species are adapted to.

Adaptive Management Response: Periods of drought would likely reduce the grass cover of the site but would not be expected to have detrimental effects to Bay Checkerspot butterfly habitat. The reduced grass cover would result in less cattle forage. Consequently, the management response would be to evaluate the extent of the forage reduction and then to adjust cattle grazing intensity and grazing period for the observed conditions. Since the site has a healthy population of host plants and Bay checkerspot butterflies despite the 1987 to 1992 drought, no management response to normal droughts are required. Droughts may negatively affect Bay Checkerspot butterfly host and nectar sources, which may result in localized butterfly extinctions, especially on warmer and/or low elevation slopes, such as those found at the DVR Ecological Preserve. Translocations from larger, more stable populations (especially from cooler and/or higher slopes) may be advised in these conditions.

Wet Periods

As noted in the discussion of drought above, wetter periods than climatic average are likely to occur. Although part of the natural fluctuation in climate, such wet periods could result in increased vigor of grasses and they could expand into areas of the Bay checkerspot butterfly host plants.

Adaptive Management Response: The expanded grass cover would result in more cattle forage. Consequently, the management response would be to evaluate the extent of the forage increase and then to adjust cattle grazing intensity and grazing period for the observed conditions.

Earthquakes

Earthquakes of less than 4.0 on the Richter scale (defined as “micro” or “minor” earthquakes by the USGS) occur frequently in the DVR Ecological Preserve and their effects on natural communities and covered species are expected to be very small or undetectable. While less common, earthquakes defined as “light” (magnitude 4.0 to 4.9) or “moderate” (5.0 to 5.9) are expected to have little to no effect on covered species or natural communities (earthquakes of magnitude 6.0 to 6.6 are not specifically defined by the USGS).

A large, catastrophic earthquake is typically defined in planning documents and engineering projects as having a magnitude equal to or greater than 6.7 (Source:

<<http://earthquake.usgs.gov/regional/nca/wg02/index.php>>. For reference, the Northridge earthquake of 1994 was a magnitude 6.7.). However, these earthquakes may be large enough to cause moderate ground shaking which may trigger small to moderate-sized landslides. These landslides are a natural part of the ecosystems in the DVR Ecological Preserve.

Adaptive Management Response: Mitigation land access will be evaluated after the area experiences a magnitude 6.7 or greater to determine if road repairs or erosion control are needed. If needed, repairs shall commence as soon as safely possible. If repairs or erosion control are necessary and will affect listed species directly or their habitat, the applicant will consult with the Service to ensure that the effects are minimized or avoided. Smaller earthquakes are unlikely to cause erosion or damage the unpaved roads to and from the preserve.

Climate Change

The following discussion of climate change is taken from chapter 10 of the Santa Clara Valley Habitat Conservation Plan (ICF International 2012):

Global climate change is occurring as a result of high concentrations of greenhouse gases in the Earth’s atmosphere (National Research Council, 2010; Intergovernmental Panel on Climate Change, 2007). Greenhouse gases include water vapor, carbon dioxide, methane, nitrous oxide, chlorofluorocarbons, and ozone. These gases absorb energy emitted by the Earth’s surface, and then reemit some of this energy back to Earth, warming the Earth’s surface, and influencing global and local climates. As more and more greenhouse gases are emitted into the atmosphere from human activities such as the burning of fossil fuels, the Earth’s energy balance is disrupted, resulting in a number of changes to the historical climate. Evidence of long-term changes in climate over the twentieth century include the following (Intergovernmental Panel on Climate Change, 2007; National Research Council, 2010; Global Change Research Program, 2009):

- An increase of 0.74 degree Celsius (°C) (1.3 degrees Fahrenheit [°F]) in the Earth’s global average surface temperature;

- An increase of 0.17 meter (6.7 inches) in the global average sea level;
- A decrease in arctic sea-ice cover at a rate of approximately 4.1% per decade since 1979, with faster decreases of 7.4% per decade in summer;
- Decreases in the extent and volume of mountain glaciers and snow cover;
- A shift to higher altitudes and latitudes of cold-dependent habitats;
- Longer growing seasons; and
- More frequent weather extremes such as droughts, floods, severe storms, and heat waves.

Non-native Species or Disease

Non-native species currently occur in the DVR Ecological Preserve and will likely be present in the DVR Ecological Preserve (*e.g.*, weeds). Additionally, there are non-native species that exist in areas outside the DVR Ecological Preserve that have the potential to spread into it and adversely affect the covered species and natural communities within the DVR Ecological Preserve. Due to the nature of invasive species, there is no unforeseen circumstance, only an upper limit to which changed circumstances will be funded. In other words, a new invasive species spreading throughout the DVR Ecological Preserve within the permit term is a foreseeable event. However, if a non-native species spread beyond the thresholds identified below, it would be considered a catastrophic event beyond the Plan scope and remedial actions to address it would not be required to be funded by the Permittee.

Diseases are not known from the DVR Ecological Preserve, but it is possible they are present and undetected, or that they could move in from neighboring areas in the future. While disease is not considered an issue throughout the serpentine grasslands of Coyote Ridge, the introduction of a new disease could be a catastrophic event. As above, such a circumstance would be beyond the Plan scope and remedial actions to address it would not be required to be funded by the Permittee.

Adaptive Management Response: The conservation strategy includes measures to reduce existing and prevent future infestations of non-native invasive species. The monitoring program will identify and map new non-native species in the DVR Ecological Preserve so they can be identified quickly and a control or eradication plan can be put into place. However, it is possible that the following events could occur despite implementation of the conservation strategy and monitoring program.

- New and aggressive non-native species could invade the DVR Ecological Preserve.

- Existing nonnative species could expand to unprecedented levels in the DVR Ecological Preserve, perhaps due to changing climate.

Disease could also enter the DVR Ecological Preserve. The biological monitors will investigate unusual or high levels of mortality or deformity in the species present, report these data to the Service, and investigate their causes by working with federal or state wildlife agencies, universities, local land management agencies, and/or other experts.

9.2 Unforeseen Circumstances

In determining whether any event constitutes an unforeseen circumstance, the Service shall consider, but not be limited to, the following factors: size of the current range of the affected species, percentage of range adversely affected by the HCP, percentage of range conserved by the HCP, ecological significance of that portion of the range affected by the HCP, level of knowledge about the affected species and the degree of specificity of the species' conservation program under the HCP, and whether failure to adopt additional conservation measures would appreciably reduce the likelihood of survival and recovery of the affected species in the wild.

If the Service determines that the unforeseen circumstance will affect the outcome of the HCP, additional conservation and mitigation measures may be necessary. Where the HCP is being properly implemented and an unforeseen circumstance has occurred, the additional measures required of the permittee must be as close as possible to the terms of the original HCP and must be limited to modifications within any conserved habitat area or to adjustments within lands or waters that are already set aside in the HCP's operating conservation program. Additional conservation and mitigation measures shall not involve the commitment of additional land or financial compensation or restrictions on the use of land or other natural resources otherwise available for development or use under the original terms of the HCP without the consent of the Permittee. Resolution of the situation shall be documented by letters between the Service and SVP.

Thus, in the event that unforeseen circumstances adversely affecting the Bay checkerspot butterfly occur during the term of the permit, SVP would not be required to provide additional financial mitigation or additional land use restrictions above those measures specified in the HCP, provided that the HCP is being properly implemented. This HCP expressly incorporates by reference the permit assurances set forth in the Habitat Conservation Plan Assurances ("No Surprises") Rule adopted by the Service and published in the Federal Register on February 23, 1998 (50 CFR Part 17). Except as otherwise required by law or provided for under the HCP, including those provisions regarding Changed Circumstances, no further mitigation for the effects of the DVR on the Bay checkerspot butterfly may be required from a Permittee who is properly implementing the terms of the HCP and the Permit. The HCP will be properly implemented if the commitments and provisions of the HCP and the permit have been or are being fully implemented by the Permittee (SVP).

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APPENDIX A.

Many botanical names have recently changed to reflect updated taxonomy published in the second edition of The Jepson Manual: Vascular Plants of California. This document uses current names and taxonomy as reflected in the 2012 manual. This appendix shows previous names used in the 1993 Jepson Manual, as this may help readers follow the names used in older documents relating to serpentine ecosystems on Coyote Ridge.

An exception is the preservation of *Streptanthus albidus* ssp. *albidus* and *S. a.* ssp. *peramoenus*. We have retained these names as recommended by the California Native Plant Society, which recognizes research demonstrating the genetic distinctness of these taxa.

The Jepson Manual, 1993	The Jepson Manual, Second Edition, 2012
<i>Amsinckia menziesii</i> var. <i>intermedia</i>	<i>Amsinckia intermedia</i>
<i>Dudleya setchellii</i>	<i>Dudleya abramsii</i> ssp. <i>setchellii</i>
<i>Linanthus androsaceus</i>	<i>Leptosiphon androsaceus</i>
<i>Lolium multiflorum</i>	<i>Festuca perennis</i>
<i>Lotus wrangelianus</i>	<i>Acmispon wrangelianus</i>
<i>Nassella pulchra</i>	<i>Stipa pulchra</i>
<i>Streptanthus albidus</i> ssp. <i>albidus</i>	<i>Streptanthus glandulosus</i> ssp. <i>albidus</i>
<i>Streptanthus albidus</i> ssp. <i>peramoenus</i>	<i>Streptanthus glandulosus</i> ssp. <i>glandulosus</i>

APPENDIX B.

Monitoring Report on Mitigation Lands for Donald Von Raesfeld Power Plant, Silicon Valley Power, April 2006.

Monitoring Report on Mitigation Lands for
Donald Von Raesfeld Power Plant,
Silicon Valley Power

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Prepared for the Silicon Valley Land Conservancy
and Silicon Valley Power
25 April, 2006



Bay checkerspot butterfly Photo by S.B. Weiss

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Monitoring Report on Mitigation Lands for Donald Von Raesfeld Power Plant, Silicon Valley Power, November 2009.

Monitoring Report on Mitigation Lands for
Donald Von Raesfeld Power Plant,
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Prepared for the Silicon Valley Land Conservancy
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11 November 2009



Bay checkerspot butterfly Photo by S.B. Weiss

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